DOCUMENT RESUME

ED 095 794 HE 005 871

AUTHOR	Smith, D. Richard
TITLE	Patterns of Innovation. An Inventory of Non-traditional Instructional Activities. Volume II.
INSTITUTION	Purdue Univ., Lafayette, Ind. Continuing Education Administration.
PUB DATE	Jul 74
NOTE	207p.; The collection of papers in this volume is designed to supplement those contained in Volume I
AVAILABLE FROM	Inventory of Non-Traditional Instruction, Continuing Education Administration, 120 Stewart Center, Purdue University, West Lafayette, Indiana 47907 ($5.00)
EDRS PRICE	MF-$0.75 HC-$10.20 PLUS POSTAGE
DESCRIPTORS	Counseling; *Educational Innovation; *Higher Education; *Independent Study; *Instructional Improvement; *Instructional Innovation; Management; Program Descriptions; Tutorial Programs; Video Equipment; Visual Aids

ABSTRACT

This document presents a collection of papers presenting an array of innovative approaches in higher education and offers papers and case studies of a variety of nontraditional activities. Some of the topics cover closed circuit TV and audio-tutorial instruction in veterinary science and medicine; televised graduate level engineering courses; the practical design approach in home furnishings; effects of various amounts and types of independent study in a nursing course, branched-program achievement testing; a program for improving instruction; a survey of Russian culture and civilization; clinician training through a self-confrontation technique; innovative instructional activity in small business management; strategic management; modular instruction in introducing biology laboratories; computer-assisted instruction for pharmacy students; counselor tutorial program; telelecture improves teaching; nontraditional instructional techniques in Horticulture; computer graphics; and systematic group training; service, and research program. A total of 54 innovative techniques are briefly described. (MJM)

ED 095794

PATTERNS OF INNOVATION

AN INVENTORY
OF
NON-TRADITIONAL INSTRUCTIONAL
ACTIVITIES

Volume II

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

By

DR. D. RICHARD SMITH

Assistant to the Vice President
and Professor of General Studies

Continuing Education Administration
PURDUE UNIVERSITY

July 1974

HE 005871

PATTERNS OF INNOVATION

AN INVENTORY
OF
NON-TRADITIONAL INSTRUCTIONAL
ACTIVITIES

Volume II

By

DR. D. RICHARD SMITH

Assistant to the Vice President
and Professor of General Studies

Continuing Education Administration
PURDUE UNIVERSITY

July 1974

PREFACE

The collection of papers contained in this volume are designed to supplement those contained in Volume I, published in July of 1972.

Together they present an amazing array of innovative approaches in higher education and offer patterns and case studies of a variety of non-traditional activities. They are reported by the individuals responsible for their implementation, in their own words, with a minimum of editing in order that the authors of the ideas can highlight and stress those aspects they feel are most important.

Volume I's wide distribution pattern, including reproduction by ERIC in both hardback and microfiche format is testimony to the interest and movement toward non-traditional approaches to learning situations. It is still available from ERIC (request document ED 077477).

It is proper that this volume, published as it is upon the date of the retirement of Dr. C. H. Lawshe, Purdue's former Professor of Industrial Psychology, Assistant Dean of the Graduate School, Dean of Continuing Education, Vice President for Regional Campus Administration and now Vice President Emeritus, be dedicated to him. These volumes would not have been possible without his support and encouragement.

The first item of the collection is a reprint of his address, Today's Public University: A Reaffirmation.

West Lafayette, Indiana
July 1974

D. Richard Smith
Assistant to the Vice
President and Professor
of General Studies

TABLE OF CONTENTS

Page

Today's Public University: A Reaffirmation; Dr. C. H. Lawshe 1

Closed Circuit TV and Audio-Tutorial Instruction in Veterinary Science and Medicine; A. R. Allen 8

Televised Graduate Level Engineering Courses; Dr. R. M. Anderson 12

The Practical Design Approach in Home Furnishings; James R. Avery 18

Effects of Varying the Amounts and Types of Independent Study in a Nursing Course; Mary Elizabeth Blatchley 21

Branched-Program Achievement Testing; Dr. Thomas A. Boyle 26

A Program for Improving Instruction; Wayne D. Brunner 34

A Survey of Russian Culture and Civilization; Dr. W. D. Buffington 42

Clinician Training Through A Self-Confrontation Technique; Dianna L. Chalk, Luella K. Glick, Patricia M. Kiser 45

Innovative Instructional Activity in Small Business Management; Dr. A. C. Cooper 51

Strategic Management; Dr. Arnold Cooper, Dr. Dan Schendel . . . 53

Modular Instruction in Introducing Biology Laboratories; Dr. William Davies 55

Computer-Assisted Instruction for Pharmacy Students; Stephen R. Deiss 57

Counselor Tutorial Program; Dr. Geraldine Deputy 59

Telelecture Improves Teaching; Dr. D. W. Downey 64

Non-Traditional Instructional Techniques in Hort 217; Dr. H. L. Flint 65

Computer Graphics in Design; Dr. Richard E. Garrett 67

Computer Graphics: A Systematic Approach to Design; Dr. Richard Garrett, James J. Lesko 72

Teaching Freshman English Composition: English 100; Dr. Laverne Gonzales 74

The "Man Series", A Suite of Interdisciplinary Courses; Dr. Richard E. Grace 81

Video Cassette Player Use in Agricultural Engineering Courses; Dr. L. F. Huggins, Dr. R. M. Peart 84

Projects in House Design; Dr. Marjorie Inman 86

Mastery-Base Personalized Instruction in Pharmacology; Anne M. Keuhnelian 88

Industrial Marketing: Strategy and Tactics; Dr. Charles W. King 94

Educational Technology Applied to an Electrical Engineering Laboratory Program; Dr. John C. Lindenlaub . . . 98

Electronic Measurement Techniques Course Taught Using Audio Tutorial Instruction; Dr. John C. Lindenlaub 104

An Application of Personalized Instruction to Remote Sensing Technology; Dr. John C. Lindenlaub 106

The Utilization of VTR To Test Motion Pictures; Karl Lohmann, Jr. 111

Vocational Development Seminar; Dr. John E. Lovell 114

Confluent Education Model for College Instruction; Dr. Phyllis Kinnison Lowe 117

New Learning Techniques for The Recognition of Insect Groups; Dr. W. P. McCafferty 122

Soil Science Study Center; Dr. W. W. McFee 126

Personnel Relations; Dr. Frederick McLimore 128

New Teaching Mode in Aeronautical Engineering; Dr. Francis J. Marshall 130

Self-Paced Instruction in EE 440 - Transmission of Information; Dr. O. R. Mitchell, Dr. J. C. Lindenlaub 135

An Excellent Mixture for PSI: Computer Science, Plato, and Knowledge Levels; Dr. Kenneth L. Modesitt 138

A Semi-Self Paced Course in Plant Layout and Facilities Design; Dr. Colin L. Moodie 142

Self-Paced Course in Advanced Production Control; Dr. Colin L. Moodie 146

"Music and History"; Dr. Gordon Mork, Mrs. Caryl Eckstein 149

A Contextual Personalized Approach to Thermodynamics; Dr. James G. Mullen 152

The Color Television System as a Case Study Laboratory; G. W. Neudeck 155

An Industrial-Academic Course in High Temperature Materials; Dr. John F. Radavich 159

Language Training for the Retarded: A Videotape Series; Dr. M. Irene Stephens 162

An Open Laboratory in Fluid Mechanics; H. Doyle Thompson. 164

Integrated Circuit Fabrication Laboratory; Dr. Hannis W. Thompson 170

Off-Network Television Programming - "One Step Beyond"; James J. Wagner. 172

Paced Spanish; Linda Walgreen 176

The "Jury System" in Landscape Architecture as a Non-Traditional Instructional Activity; T. D. Walker 180

A Modified Personalized Instruction-Lecture Course in Chemical Engineering; Dr. Phillip C. Wankat 181

Individualized Instruction in Anatomical and Mechanical Analysis of Human Motion; Dr. Carol J. Widule, Dr. Gladys Garrett 187

Instructional Systems Approach to the Teaching of Fundamentals of Speech Communication; Raymond S. Wilkes 188

Individualized Instruction in Beginning German; Dr. Joe Wipf . . 192

Systematic Group Training, Service and Research Program; Thomas H. Zarle 198

The Span Plan Program for Women; Dr. Cecelia Zissis 200

TODAY'S PUBLIC UNIVERSITY: A REAFFIRMATION

An Address
By C. H. Lawshe[1]
Vice President for Regional Campus Administration
and Dean of Continuing Education

Of course, it is trite to say that we live in a scientific age. However, any serious discussion of higher education, whether it focuses on quality or some other aspect, cannot ignore the impact of the continuing expansion of science and technology on institutions of higher education and what they do. I would like to open my remarks with two observations relevant to this fact.

> First, the content of all science and technology is not of a uniform degree of abstraction. For example, certain principles in the field of electronics are relatively concrete in nature while others are extremely abstract in that they call for a high level of mental manipulation on the part of the person who is to understand them. There is, in fact, a continuum or spectrum of abstraction ranging from the very simple to the extremely complex.
>
> Second, this spectrum of abstraction is not of a fixed length throughout all time. As complex hypotheses are postulated, and as intricate mathematical models are applied to test them, highly abstract research results are evolved. Hence, the spectrum continues to be extended at the complex end with the passage of time. The resulting content, in order to be assimilated by the individual, requires greater basic understandings and an increasingly higher level of mental agility.

The dynamic nature of the social forces that are at work makes it essential that we periodically examine higher education as it involves and relates to science and technology. Let us begin such an examination by recounting certain recent trends that are known to us all:

[1] Dr. Lawshe served as the first Dean of the School of Technology. His address was presented before the technology faculty at their eleventh annual faculty convocation recognizing the 10 years of the school's existence.

- During the past two decades, our higher education scholarship and fellowship programs have identified the academically superior high school students, have supported them as undergraduates, have re-identified them as promising graduate students, and have provided them with support through the Ph.D. degree. The result: we have produced many very bright, highly educated people who have had little, if any, exposure to the world outside the academic cocoon.

- During the expansion years in higher education, university administrators functioning in a tight faculty labor market, frantically competed with each other for personnel to man their operations. The result: the bargaining process produced a redefinition of the manner in which faculty members distribute their time and a concomitant reduction in teaching loads.

- During the salad days of federal grants and contracts, government agencies established a pattern of funding the professor rather than the institution. The result: faculty members tended to shift their personal loyalties toward the disciplines and professions and away from their institutions.

The confluence of these somewhat independent forces has had a common institutional impact. Faculties have become less enchanted with teaching and more preoccupied with research. The ivory towers, most of which had crumbled, particularly in land-grant universities, have been quickly rebuilt higher and stronger as our faculties have become less aware of and less sensitive to the needs of the outside world.

The outcome, of course, is most acute when we consider curricula designed to produce practicing professionals or quasi-professionals in contrast to pure scientists. The expanding universe of knowledge, in every field, makes curriculum content selection increasingly difficult. Faced with the necessity of choosing from a tremendous volume of material, faculties have tended to select that which is new and that which is exciting to them, sometimes at the exclusion of that which has greater social utility. In most undergraduate programs the tendencies have been:

- to increase the emphasis on mathematical modeling;
- to emphasize theoretical analysis and to de-emphasize application; and
- to emphasize preparation for graduate school.

These comments are not intended to reflect an anti-research attitude. People in universities including Purdue, must advance knowledge in their fields. But, I am saying that, too often, faculty interest rather than social utility has dominated the curriculum content selection process. The outcome is that curricula throughout our university, more and more, are composed of material selected from the abstract end of the science continuum which I mentioned earlier. And from all this has emerged the currently accepted concept of what constitutes quality in higher education. The logic runs something like this:

- The more abstract course content is, the more difficult it is for more people;
- The more difficult it is, the higher the quality.

It is obvious, I am sure, that I have overdrawn and overstated my case for emphasis. Purdue University numbers among its faculty, many individuals who are exceptions to the stereotype which I have been presenting. The School of Technology faculty of course notably deviates from the stereotype. I would be neither fair nor accurate if I did not acknowledge the presence of you and these other faculty members. Nevertheless, you constitute a minority, and the majority has functioned to help develop and perpetuate our faculty reward system which provides exceedingly rough-going for the minority. In the aggregate, we have fallen into a trap in which we confuse "quality" of education with "level of abstraction"; many of us have really come to believe that "The more abstract it is, the higher the quality".

Education is a change process; educational institutions are change agents. They bring about change in individuals

- by providing them with information which they do not possess;
- by helping them acquire skills which they do not have; and
- by causing them to develop attitudes or new ways of looking at themselves and at the world and its problems.

The true quality of an institution rests upon the extent and magnitude of the change it brings about in people and the concomitant long-term positive impact it has on society. Part, but certainly not all, of this impact emanates from the institution's contribution to new knowledge.

Much of what I have been saying is reflected in the following excerpt from an article which appeared in Educational Record a number of years ago (October 1960).

- Presumably College A has improved its quality by raising the SAT score of the entering students, and College X hopes to do likewise. Colleges that have to take the leftovers presumably will be of poorer quality.
- This seems at first glance an odd way to conceive of the quality of a college. It is comparable

to saying that a good psychotherapist is the one who is able to attract curable patients and to avoid difficult problems.

- One might suppose that the quality of a college would reside primarily in the richness of its curriculum, the effectiveness of its teachings, the atmosphere of devotion to learning that it is able to maintain, and so on.

- But there is a point to saying that everything depends on the student, for if the measure of quality is the number of students sent to graduate school - or "good" graduate schools - then surely the way to proceed is to select students who by virtue of ability and inclination would be hard to distract from that purpose. Then the faculty could increasingly devote itself to promoting the scholarly disciplines without too much interference from demanding students. They might further improve "quality" as measured . . . in terms of standards which seem to be largely a matter of how closely the curriculum resembles what is taught in graduate schools.

- But if we say the aim of a college education is to develop the individual, we have to take a rather differnt view of the matter. Suppose we had a useful conception of the developed individual. Suppose the conception included such general attributes as freedom from prejudice, depth of interest, a humanized conscience, and eagerness for continued learning; and suppose we had ways of measuring these attributes. Then we could measure the quality of the college in terms of its success in producing individuals who had the desired attributes.

- But here, too, we would have to deal selectively with the fact that some colleges might attract students who were relatively highly developed from the beginning. The real measure of a college's success would have to be in terms of how much change it was able to bring about. If it took students with average SAT scores of 400, who were provincial, narrow minded, conformist, and anti-intellectual, and changed them into people of significantly greater breadth, independence, and thoughtfulness, one would say it was doing a good job even though it never recruited anyone from outside its state or attracted any nationally known professors.

- The same kind of perspective might be taken with respect to so fundamental a term as "ability". Is ability, whatever it is that the Scholastic Aptitude Test measures, something that has been shown to be moderately correlated with academic success? Or should it be defined in such a way as to include a wider range of abilities, potential for growth, and all those dispositions of the whole personality that enter into the determination of how the individual performs the tasks of his life?

I challenge the thesis that, "The more abstract it is, the higher the quality."

The fallacy of the reasoning, of course, rests in the fact that it is possible to have quality at any level of abstraction; instruction in the primary grades may be of high quality (or low!). In a publicly supported institution, we must serve the needs of society; we do this

- By supplying society with a broad spectrum of scientifically and technically trained personnel, and
- By providing higher education opportunities for students of varying abilities and talents.

Any viable concept of publicly supported higher education must encompass both of these objectives, and any definition of educational quality must similarly accommodate them.

For Purdue University whose survival as a prestige institution depends upon fiscal support from the body politic, a quality concept based upon traditional elitist attitudes is not acceptable. With a majority of high school graduates now pursuing higher education of some sort, it is clear that not every institution of higher education can survive if all institutions design all of their curricula solely for the so-called "top 'x' percent." Nor is this necessarily bad.

Woodrow Wilson had this to say when he wrote The New Freedom:

> When I survey the genesis of America, I see this written over every page: nations are renewed from the bottom, not from the top. Everything I know about history, every bit of experience and observation has confirmed me in the conviction that the real wisdom of human life is compounded out of the experience of ordinary men. The utility, the vitality, the fruitage of life comes, like the natural growth of a great tree, from the soil, up through the trunk into the branches to the foilage and the fruit. The struggling unknown masses of the men who are at the base of everything are the dynamic force lifting the levels of society. A nation is as great, and only as great, as her rank and file.

The time has come to reaffirm the land-grant philosophy and to adapt it to today's world. The public university is the instrument of organized society by which it perpetuates itself and by which it advances itself. As a public institution Purdue University needs to provide educational programs of several levels of abstraction designed for students of varying abilities.

This can be done, and it is possible for all such programs to be of "high quality".

CLOSED CIRCUIT TV AND AUDIO-TUTORIAL INSTRUCTION IN VETERINARY SCIENCE AND MEDICINE

A. R. Allen
Professor of Medical Illustration

A single, moderately priced color television camera and two one-inch videotape recorders were added to the Veterinary School's television production equipment in the summer of 1972. The advantages of color videotape over black and white for medical productions was immediately evident.

Federal funding of a special projects grant then provided for extension of our videotape utilization capabilities by allowing fourteen self-study stations to be equipped with 3/4 inch cassette play back machines and color receivers. Veterinary students have access to the laboratory 24 hours a day, seven days a week. The laboratory works on a smorgasbord, self-service basis. Study materials made available range from simple slide sets or audio tape recordings of lectures to formal programmed instruction using mixed media or 3/4 inch videotape cassettes.

Students are free to work in groups or independently. By providing the open laboratory, there is a very real interaction between students that goes beyond class boundaries. Any student is free to use any material regardless of his class standing or the target audience of the original production.

Although traditional audio-tutorial media (slides, tapes, 8mm films, etc.) is still used quite extensively in Veterinary Medicine, the majority of the new programs being produced are utilizing videotape as the primary program vehicle. This medium serves as an excellent "funnel" into which all forms of traditional media may be poured and sequenced to fit various instructional needs. Photographic slides, motion pictures, still photographs, live demonstrations, direct microscopic slide projections, radiographs, physiograph recordings, gross and macroscopic specimens, live patients, etc. can all be synchronized with voice to provide immediate programming capabilities.

Television is used by all five teaching departments in the School and over 150 tapes have been produced to date. The nature of the productions are generally direct, customized, and low key. No attempt is made for high profile, universally adaptable programming since professional studio capabilities do not exist. Videotapes are used as in-house instructional aids and not as commercial productions.

In-house videotape productions are extremely expensive in terms of equipment and technical personnel. However, they are relatively inexpensive in terms of supplies and production time. Where color, sound, motion, and rapid production time are necessary, videotape is worthy of consideration.

The Veterinary School is linked to the IHETS network via a single coaxial cable from FWA-8. WAT-21 medical education programs are received daily on channel 6 and are available for viewing at all 14 video equipped carrels in the Multi-media Laboratory. Videotaping for delayed scheduling is also possible.

Color videotape has also provided the School with the capability of videotaping outside speakers for delayed play back. Two weeks of concentrated taping of guest lecturers have produced forty-four tapes on toxicology. These tapes are being used to constitute the basis for thirty hours of formal classroom instruction in the course and will also be available for independent study in the Multi-media Laboratory.

The U-matic cassette recorder-player is the heart of a pilot videotape case history program. Recording equipment is placed in the clinical treatment area. Faculty and staff are instructed in taping techniques. Utilizing the convenience and simplicity of the cassette format, a profile on individual patient progress and disease course can be developed. Sequential recordings are made beginning with time, date, and case number. Tapes are not rewound at the end of a recording or play back. Therefore all cassette case histories are "ready" for new recording should signs, symptoms, or conditions change. By utilizing the edit capabilities of the JVC machine, it is possible to assemble scenes without erasing the tail of the preceeding take or creating an unnecessary blank between takes.

At present the pilot program is limited to black and white. Converting to color will only require new cameras should use and evaluation warrant it.

In addition to the standard programmed uses as described above, the CCTV has been used as:

a) mirror image or instant replay for student and faculty
b) wide distribution of programs or speakers throughout the school
c) practical examinations for simultaneous presentation of materials to large numbers of students
d) open house and public demonstrations of procedure from restricted areas such as surgery
e) videotape exchange with other institutions

f) recording field cases and animal behavior studies

g) reconstruction of sectioned specimens in planes different from original plane of sectioning

All phases of instruction (teacher directed, student directed, programmed, clinical, etc.) are supported by a full service Medical Illustration and Communications Unit.

TELEVISED GRADUATE LEVEL ENGINEERING COURSES

Dr. R. M. Anderson
Associate Professor of Electrical Engineering and
Engineering Coordinator for Continuing Education

Background

Purdue University is the only state supported university in Indiana that grants graduate degrees in engineering. In particular the West Lafayette campus of Purdue is the location of the greatest number of engineering graduate faculty. However, it is clearly not very convenient to require all persons in the state who wish to take graduate engineering courses to come to West Lafayette for these courses. This is particularly true for engineers who are employed full time at a company location remote from Lafayette.

There are about 26,000 engineers in the state of Indiana. The large majority of these are not able to participate in any regularly scheduled West Lafayette campus graduate engineering courses. They may live too far to commute, or the scheduling may make their attendance impossible or just too difficult.

The state is fortunate to have a system of regional campuses of the major state universities. Purdue University has regional campuses at Hammond, Westville, and Fort Wayne. Purdue's regional campus at Indianapolis has been made a part of Indiana University-Purdue University at Indianapolis (IUPUI). There are engineering faculty at Hammond, Fort Wayne, and IUPUI campuses. These campuses are located in the midst of high population densities within the state, so that the local engineering faculty can meet some of the local need for engineering instruction. However, these local staffs are limited in size, and, moreover, they have a primary responsibility to provide undergraduate engineering instruction. Hence, they can not completely meet the local needs for graduate level engineering courses.

The state is also fortunate to have the Indiana Higher Education Telecommunications System (IHETS). This state-wide system allows televised instruction to be original at the West Lafayette campus of Purdue University and at two other locations in the state. This televised instruction is available via closed circuit at 16 campus sites within the state. In the Indianapolis area this instruction is also available directly to the industrial locations via an ITFS transmitter.

Therefore, because it is within the mission of Purdue University's West Lafayette faculty, because there is a need to deliver graduate level engineering courses throughout the state, and because of the availability of the regional campus system and the state-wide telecommunication system, Purdue University has been televising graduate level engineering courses for several years. This activity has been increasing in magnitude and diversity in recent years.

Origination Facilities

There are three origination facilities on the West Lafayette campus. Room 317 E.E. is a small classroom that has been designed especially for televised instruction. The room has a seating capacity of 24, two wall mounted TV cameras at the back of the room, one overhead camera mounted over the instructor's desk, two small TV monitors in the instructor's desk, two large TV monitors near the front of the room, and four small TV monitors along the back row. Using this room the professor normally sits at the desk and writes on a pad as he lectures. Sitting at the desk, the instructor can see two TV monitors in front of him. One shows him the output of the overhead camera, and the other shows him the TV picture that is going out to the class. (This may be the overhead view or one view from the back of the room or some combination of views.) The production aspects of the classroom presentation are under the control of a single director in the control room in the basement of the building.

The second origination facility, Room 170 E.E., has seen the greatest use from a historical point of view, but it is no longer our primary origination facility. Room 170 E.E. is a relatively large lecture room (seating capacity is 169) that has two manned TV cameras at the back of the room and four TV monitors in the front half of the room. Using this room the professor usually has a number of students (usually 50 or more) in the room with him; he lectures using the blackboard, and his classroom activity is picked up by the microphone he wears and the two cameras at the back of the room. The production aspects of the course are controlled by a director and an engineer located in FWA-8 adjacent to the Electrical Engineering Building.

The third origination facility is the Television Studio in FWA-8. This is a typical TV studio with 3 floor cameras and full versatility in lighting and set-design. This facility is seldom used for graduate engineering courses. When it is used, the professor is usually alone in the studio (except for the cameraman). As visual aids, the professor usually uses slides or a felt pen on a newsprint easel.

Televised Course Reception Modes

The televised engineering courses are viewed either live (i.e., simultaneous with the Lafayette class) or on a video tape delay basis. Within each of these two categories there is some variety of specific viewing system.

Live Reception. By live reception we mean that the student remote from the Lafayette campus is viewing the classroom activity simultaneously with the classroom presentation. The TV classroom presentation is switched onto the IHETS network and is routed to the appropriate receiving locations. Usually these locations are the regional campuses at Hammond, Fort Wayne, and Indianapolis and the ITFS transmitter in Indianapolis. From the transmitter the signal currently goes to four industrial plant sites in the Indianapolis area. (These are Allison, Bell Labs-Western Electric, NAFI, and R.C.A.) In both of the live reception situations, campus and in-plant, the remote student has an audio access to the instructor. He may pick up a phone or just speak into a microphone, but he can interrupt the professor to raise a question or make a comment at any point during the lecture.

Video tape delayed reception. When a remote student receives his instruction via a video tape, he does not have the ability to interrupt the lecture. However, this reception mode offers scheduling advantages that in many cases are more important than the disadvantages of no talk-back. Some regional campuses will tape the class as it is transmitted to them via IHETS. Then the tape(s) will be shown at some convenient, scheduled hour(s) in the evening. Often three class hours are shown in one evening. This means a student who is normally full-time-employed drives to the regional campus only one night per week to attend a three credit hour class.

Another video tape reception mode is where the class is taped at Lafayette, and then the tapes are supplied to the appropriate viewing location. Currently we are supplying taped instruction to industrial sites and to some regional campuses.

Summary of Recent TV Courses and Enrollments

	First Semester 1971-1972		Second Semester 1971-1972	
	EE502	EE556	EE504	EE547
Fort Wayne	13	6	17	5
IUPUI-38th St.	15	17	7	15
R.C. Sub-totals	28	23	24	20
West Lafayette	57	15	35	18
Total	85	38	59	38

	First Semester 1971-1972		Second Semester 1971-1972			
	EE506	EE576	EE500	EE647	ME528	ME576
Calumet	0	0	0	0	7	0
Fort Wayne	9	7	4	0	7	7
IUPUI-38th St.	12	0	7	1	14	1
Bell-Western Electric Indiana	0	0	0	7	3	6
RCA, Indianapolis	10	24	0	9	3	0
Columbus	0	0	0	0	9	0
R.C. Sub-totals	31	31	11	17	43	14
West Lafayette	39	15	45	7	72	0
Total	70	46	56	24	115	14

First Semester
1973-1974

	EE502	EE548	ME513	NE501
Calumet	0	3	2	11
Fort Wayne	13	5	6	0
IUPUI-38th St.	8	0	12	0
Allison, Ind.	4	0	17	0
Bell Labs-Western Electric, Ind.	2	13	10	0
RCA, Indianapolis	1	5	9	0
NAFI, Indianapolis	1	3	0	0
Columbus	0	0	10	0
R. C. Sub-total	29	29	66	11
West Lafayette	44	7	26	24
Total	73	36	92	35

Second Semester
1973-1974

	EE504	EE556	IE536	IE590	ME500	ME613	NE502
Calumet	9	0	0	0	16	0	12
Fort Wayne	0	0	5	0	0	5	0
IUPUI-38th St.	0	0	8	1	0	0	0
Allison	1	5	1	5	0	0	0
Bell-Western Electric	0	2	3	2	0	0	0
RCA, Indianapolis	0	2	0	1	0	0	0
NAFI, Indianapolis	3	0	1	2	0	1	0
Columbus	0	0	0	0	0	7	0
R. C. Sub-totals	13	9	18	11	16	13	12
West Lafayette	27	11	0	13	19	11	25
Total	40	20	18	24	35	24	37

THE PRACTICAL DESIGN APPROACH IN HOME FURNISHINGS

James R. Avery
Assistant Professor of Equipment & Family Housing

The course to be described below is one of the results of a continuing effort within the Equipment & Family Housing Department at Purdue University to develop means by which the practical and workable aspects of aesthetics and design might be presented in a meaningful way to the student body. While the approach is clearly a break with tradition, it is felt that it will satisfactorily accommodate this new direction without compromising any of the traditional educational goals.

As an attempt to bring to the advanced student a clear conception of the inter-workings of a career in Housing and Home Furnishings, E & FH 431, an advanced Home Furnishing course, formed into 431 Incorporated, a design firm dealing with residential contracts. The students were assigned responsibilities as heads of various departments within the corporation on a rotating basis, so as to expose each to the demands of each step toward the completion of a successful design concept. (Successful from both the designer profit and the client satisfaction standpoint). The threat of grades was removed by giving each student a set grade of C dependent only upon his performance as an interested member of the firm. (Reasonable attendance record, prior indication of need for non-attendance, etc.). A or B level could be attained only by student initiative. (Completion of all assigned projects or advanced study in area of interest).

These self-motivation factors tend to make the students extend themselves into areas of study and depth of application they might not otherwise attempt, for fear of jeopardizing their grade point.

To put it more exactly, students are doing more, enjoying it more, and coming out with a better understanding of the field of study.

To give a student a touch of reality into the base aspects of the Home Furnishing field (stocking, inventory, billing, collecting, dusting, cleaning, etc.) and an understanding that all is not excitement and glamour, although this is relevant, each student was assigned to a local business dealing in some aspect of residential design. Their assignment involved a two-hour period once a week for the semester on a non-remunerative basis. The main purpose of this aspect of the course is to provide the student with the opportunity to develop into a more mature capable Housing graduate by integrating his university experience with retail or studio experience related to his field of study.

The first nine weeks of the semester are given to the development of the basic principles of client management. During this time the student attends one fifty-minute and one two-hour discussion session each week. At the end of this section of the course, the students are evaluated on their understanding of these basic principles by group project evaluations.

The next six weeks are the applications section. During this period there is only one scheduled class meeting each week in which subjects of general interest are discussed. (Client-designer relationships, designer-trade source relationships, time allowances, etc.).

At the beginning of the application section the student chooses five required client situations from a list of ten offered. Approaches range from merchandizing to advertising, to display or to interior concepts; each student takes the approach which most interests him as a career possibility.

The value of the method is that it allows the student to discover for himself those areas of the field for which he is better suited or not suited at all. Every attempt is made to determine the progress and to uncover the hidden and sometimes small problems that create mental blocks or "hang-ups".

Student response to this approach has been overwhelmingly positive. Generally, they respond most favorably to the choice of areas of interest, to demonstration of how the basic principles are applied to specific problems in their chosen field of study, to the combination of structural and self-paced learning, and to freedom to explore design in a rather open fashion.

It is believed that the level of presentation, topic content, and course format has combined to make this course an exciting and rewarding educational experience for our undergraduate majors.

EFFECTS OF VARYING THE AMOUNTS AND TYPES OF INDEPENDENT STUDY IN A NURSING COURSE

Mary Elizabeth Blatchley
Associate Professor of Nursing

Independent study, with its inherent flexibility, is becoming a popular form of non-traditional instructional activity. The purpose of our project is to gather information concerning best use of this approach for associate degree nursing students taking the course "Medical-Surgical Nursing of Adults and Children."

The specific questions we are asking are these:

1. How much independent study produces most efficient learning, in terms of proportion of total course content?
2. What type of content is most effectively taught by means of independent study?

A secondary objective is to determine whether a personality characteristic (Inner or outer - directedness) is related to a student's success in using independent study.

To meet these objectives, we have taught the course in the traditional lecture method to three control groups, and are now teaching the third of three experimental groups, using gradually increasing amounts of independent study for the latter. Clinical hospital experience, an integral part of the course, has remained unchanged.

Course content for all groups has been expressed in terms of specific behavioral objectives, and these objectives have been made available to students, with the understanding that testing will be over these objectives and these objectives only. All groups have thus been tested over these objectives, and all groups have been pre-tested at the start of each new unit.

For the experimental groups, faculty have broken down the four units of course content into smaller parts or "modules." We then developed criteria to identify those modules which are best using independent study (Type I), those modules which are best taught using traditional methods (Type II), and those modules which fall in neither of the first two categories (Type III).

These criteria are as follows for Type I:

1. Concept to be taught is tied to a procedure or to a particular piece or pieces of equipment.
2. Concept could best be illustrated or demonstrated by allowing the student a close or repeated look at slides, diagrams, or other visual aids.
3. Concept is a review of material previously taught in basic science or other supportive courses.
4. Concept concerns new or advanced medical equipment or procedures which must be illustrated since they are not seen or done locally.
5. Well done and up-to-date commercially developed independent study content is already owned by the department.
6. Concept may be already understood by some students, who could test out and thus avoid repetition.

The criteria for Type II are as follows:

1. are attitudinal in nature.
2. may have learning exhanced by interchange of ideas and experiences among students.

3. can best be presented by a qualified guest lecturer who is very well prepared in a particular area.

Any content which falls into neither of these categories was classified as Type III. This is a large cluster of content, mostly factual in nature, and could, we think, be taught well using either method.

When this typing of content had been completed, we randomly selected modules (called minicourses) for development into a modified audio-tutorial form of independent study presentation. Modules from all 3 types of content were included in the random selection.

We then proceeded to develop and use the minicourses with the experimental groups. In our development we have tried to use a multi-sensory approach to take advantage of the different ways people learn. We've also tried to provide variety in presentation, and to encourage active student participation. We have used slides, tapes, films, filmloops, programmed instruction, games, and other approaches. Some minicourses can be done at home - most must be done in our Learning Resources Center. In the Learning Center there is always a nurse-instructor present to provide encouragement and answers to questions.

Because we are interested in the effects of varying total amounts of independent study, we developed enough minicourses to equal one-fourth of the total semester lecture hours in experimental group I, one-half the total semester hours in experimental group II, and we are now using the experimental group III. The rest of the content, for these experimental groups, was or is being taught in the traditional manner.

By comparing scores on a standardized test given immediately after the completion of the course, to both experimental and control groups, a measure of the effectiveness of the total amount of independent study will be obtained. (Homogeneity of experimental and control groups will be established by comparing SAT scores and grade point indices of all groups.)

Another measure of effectiveness, focusing on retention of material, will be obtained by administering a similar test one year later to students in both groups.

A measure of effectiveness for each module will be obtained by comparing quiz scores from those "chunks" of content taught traditionally with quiz scores from those chunks of content taught by means of independent study. This procedure will be carried out for all modules, whether Type I, Type II, or Type III.

The effect of inner- or outer-directedness on success in independent study will be measured by administration of the Rotter Locus of Control Scale to all students at the beginning of the semester. Scores on the scale will be correlated with test scores in order to assess any relationship which might exist between the two.

Because we have not yet completed the experimental period, we have no data as yet concerning our specific questions. We do know something, after almost three semesters of using the independent study approach, about how students and faculty feel.

Faculty do not now feel, that we save any time with this method, and we know that time for revision will be needed on a continuing basis, just as time for lecture revision is always needed. Some students (not many) simply do not like this way of learning.

Some are not sufficiently self-disciplined, and have difficulty making their own "when to do it" decisions.

However, we think that self-discipline and the ability to accept responsibility are desirable characteristics for nurses, and if we can help them to develop these qualities by giving them increased responsibility for their own learning, that is an advantage.

Most students are enthusiastic, and tell us that they especially like the flexibility of the system and the variety of approaches it allows. Faculty appreciate the opportunity to develop desired content completely.

Overall, we feel that independent study is a useful tool for us, and we will continue to use it in some form or amount.

BRANCHED-PROGRAM ACHIEVEMENT TESTING

Dr. Thomas A. Boyle
Associate Professor of Engineering

This activity is based upon the adoption of a format, previously used with materials for programmed instruction, for purposes of achievement and diagnostic testing. In addition to unusual diagnostic capability, the format enables repeated administration of the same test for monitoring the progress of individuals or groups of students. Principal test development has been done in mathematics, physical science, and fortran, however the test format can be adopted to practically any subject. Presently the test capability is being extended in two directions, (1) through programming the generation of individualized and personalized summaries of student progress, together with recommendations for the student's next effort, and (2) through programming graphic portrayal of the scores obtained from a series of four administrations of one of the tests.

Test Format

At first encounter a test of this type may seem quite like an ordinary multiple-choice achievement test. The test items are arrayed in a booklet and they are numbered in sequence. Response to each item is made by selecting the best of three answers listed. The big difference to be noticed, the programmed feature, is that the test items are NOT attended in numerical sequence. Nor does the respondent have the customary option of deciding which questions he will consider. Each test item corresponds to a branch point, at which the next step is determined by the answer selected. Each time an answer is selected the number of the item next to be considered is also determined. The array of test items may be regarded as a chain of branch points. At each point he comes to, the respondent must make a decision in order to proceed. If he selects the correct answer, he will take one path and consider the next item on this path. If he does not know the answer, he must guess it in order to go on. In such instances of pure guessing, he has a two in three chances of taking another path and considering next another test item.

The diagnostic capability of this test format is invoked by establishing cyclic sequences in the array of test items. For example, in an elementary algebra test the items were arranged in five groups related to (1) straight line equations, (2) evaluating expression, (3) multiplying and factoring, (4) radicals and exponents, and (5) inequalities. Regardless of the route established by any respondent through the array of test items, he cannot escape considering a series of cycles in which he encounters a test item from each of these groups. This arrangement is intended to yield independent responses, and to prevent a student's perception of his own strength and weakness from dictating his choice of test items. The format offers certain other advantages, for example the foiling of some common forms of student cheating.

Test Scoring

The use of a computer enables programmed test scoring which would otherwise be virtually impossible. The procedure followed here is to keypunch the column of numbers representing each student's name and an identification number stamped on each answer sheet before processing. The scoring procedure, programmed in fortran, awards a single point for each correct response. The score is accumulated in parts, corresponding to the aforementioned groups of test items. Each part score, or subtest score, is listed for each individual in the output from the scoring program. No penalty is given for single mistakes, however the program does recognize and penalize errors in sequence.

A total score is determined for each person by summing his subtest scores. The program outputs the number of items attempted by each respondent and also the quotient obtained by dividing the student's total score by the number of items he attempted. The scoring program also identifies all items on which each person made a mistake. This is useful for the teacher in reviewing the test scores with the student. Such review does not preclude the test being administered at other times to the same student. Evidently the review of the specific test items on which a student has errored, serves to assure his taking a new path through the array of test items when he tries the test again. Additional features incorporated into the scoring program include the tallies of all correct and incorrect responses to each test item. An example of the standard scoring program output for an elementary algebra test appears as Figure 1.

Individual Summary

Figure 2 presents an example of a summary generated for a student on the basis of her responses on a branched-program test in elementary algebra. The example is indicative of the level of individual diagnosis presently attainable from the comparison of a person's scores with norms obtained from testing a representative group of students with similar experience. Approximately 180 different messages can be generated, depending principally on the person's ratio score and the speed at which he works. Persons who obtain high ratio scores, and who work reasonably fast, are encouraged to go on to more advanced materials. Those of intermediate score pattern are advised to work on the materials in two subtests and repeat the test. Low-scoring students are advised to see a counselor or, alternatively, to work on one topic. The only input to this program consists of the norms and the responses from each person taking the test.

Graphic Record of Test Scores

Figure 3 portrays the progress of a class of 30 students during the semester in which they were studying fortran computer programming. The scores represented are mean scores obtained from four administrations of the same test. The upper row of four graphs shows the group mean scores as sets of eight bar graphs. The symbols used suggest the values which they represent, i.e., the "T" represents the mean total score.

The second row of graphs includes plots of each separate score, for each successive administration. The labels on these graphs show, at least in brief form, the topics in each of the five subtests. The speed at which a respondent works is indicated by the number of items he attempts. The ratio score is simply the total score divided by the number of items attempted. In general, the maximum value obtained in any category is taken to be the full scale for that category.

```
   IDENT     NAME            SCR NF  RA     1  2  3  4  5  6            DIAGNOSTICS        HOMETOWN HIGH SR MATH OCTOBER M-06

  1 6136 BERGOTH ROSANNE    22 27  .815   6  5  4  3  4  5  23 54  9 14
  2 6137 BENNETT RANDY      29 54  .537  11  8  5  7 -2  5  23 33 XX 21 41 48 13 XX 54 12  2 43 21 41 48 13 18 33
  3 6138 BEVINGTON PATTY    21 44  .477   9  7  4  6 -5  5  23 54 12 39 21 41 48 13 49 11 39 21 41 50 55
  4 6139 COVELL AMY         33 41  .805   8  8  6  4  7  4  XX 39 41 54  9 11
  5 6140 CRAGG CLINT        38 54  .704   9  7 11  6  5  8  36 33 12 35 28 41 48 36 37 35  9 11 12
  6 6141 DIETZ HENRY        49 68  .721  12 12  6  9 10  2   6  4 25 47 28 25  2 41 34 23 54 27 XX 12  2  9
  7 6143 ELDREDGE MARTIN    27 36  .750   8  6  7  2  4  5   5 11 39 41 14 54 29
  8 6144 FISHER CHUSTOPE    26 33  .788   6  6  6  7  1  9  36 54 27 35 21 23 54
  9 6145 GOODRICH DAVID     18 33  .545   7  2  1  4  4  5  23 54 51 37 35 43  9 31 49  5
 10 6146 GRIFFITH PHIL      24 58  .414  11 10 -6 -1 10  4  XX 39 41 32  4 56 27 35 17 39 41 32  4 56 27 35 17 24  9  4 56 27
 11 6147 GARDNER DEBBIE     18 35  .514   5  7  3  2  1  5  36 18 23 54 29 43 58 41 50 48  4 29
 12 6148 HEINRICH DAVID     45 45 1.000  10 10  9  9  7  5
 13 6149 HALL MARK          21 34  .618   6  6  6  1  2  5  36 18 33 25 XX 48 14 49  5 11  2
 14 6150 HUBBELL BETH       35 46  .761   9 10  4  6  6  3   1 34 23 39 41 49 11 39  9  8
 15 6151 HOGAN DOUGLAS      21 33  .636   5  5  5  2  4  4   8 48 14 49 11 34  5 56 12
 16 6152 ILERSICH JAMIE     25 45  .556   7  8 -2  6  6 -1   1 34 23 54 51 47 21 41 48  4 54 51 47 21 41 48
 17 6153 JOHNSON RICHARD    33 41  .805   9  7  8  3  6  4   8 18 33 25 14 39  9
 18 6154 JACKSON SALLY      13 28  .464   4  5 -4  5  3  4   8 48  4  5 27  2 43 21 34 23
 19 6155 JOHNSON JOHN       17 25  .680   5  4  2  1  5 -1   1  4 54 25 41 32
 20 6156 KING MARY ELLEN    20 26  .769   5  5  3  3  4  5  36  4 54 11 39  9
 21 6157 KOVAC FRANCES      19 33  .576   6  6 -1  5  3  5  23 54 51  2 43 21 41 48 33 56
 22 6158 KLATKA DIANE       44 64  .688  14 12 -2 10 10  5  23 54 11 20 47 28 41 20 47 28 33 29 27  2
 23 6159 LOWE MARTHA        22 45  .489   9  6 -4  7  4  5  36 54 11 51 45 47 39 21  4  5 28 57 17 39 XX 55
 24 6160 LEYDE RICHARD      29 35  .829   7  8  5  5  4  5  23 56  9  4 56
 25 6161 MOORE PAULA        38 45  .844   9  9  7  6  7  5  36 39 41 56 12 39 41
 26 6162 MCEWEN ROBERT      14 21  .667   5  4  0  2  3  1   1 13 XX 17 41 XX
 27 6163 MCCONNELL JEFF     11 19  .579   4  4  0  1  2  5  23 56 27 25  2
 28 6164 MOONEY LEE         22 33  .667   6  6  1  5  4  5  36 49  5 11 28 47  9 33 51
 29 6165 MALISE MARTY       22 27  .815   5  5  4  5  3  5   5 39 21 42 48
 30 6166 MINER RANDY        32 46  .696   9  7  3  6  7  4  XX 39  9 13 54 17 39 41 54 11 20 43
 31 6167 MCCLELLAND DEAN    35 38  .921   8  8  8  6  5  5   9 11 39
 32 6168 NOVAK JACK         27 36  .750   6  6  7  6  2  8  36 33 XX 36 54 57 39 41
 33 6169 NIKKILA JANE       31 38  .816   7  7  5  7  5  5  23 54  7 39 41 39
 34 6170 OSBORNE RICK       24 44  .545   7  5  1  5  6  4   1 34 23 54 51 45 57  2 XX  2 41 48 14 49 33
 35 6167 PARKER MICHAEL     43 47  .915  10 10 10  9  4  8   1 14 39  9
 36 6172 LEE RICHARD        19 34  .559   4  4  7  2  2  6   6 34  5 11 35 21 36 18 33 29 27 12
 37 6173 ROWLEY BOB         11 24  .458   5  5 -4  2  3 -1   1 XX 46  8 49 11 51 47 28
 38 6174 STRAINIC JOHN      22 35  .629   7  6  0  5  4  5   5 11 20 47 39  9 33 29 27  2
 39 6175 SCIBBE STEVE       36 42  .857   9  7  9  7  4  5  12 58 41 54 22  9
 40 6176 SWIFT STEPHANIE    15 29  .517   4  6  1  4  0  4   1 13 36 54 11 20 47 28 22  9 36
 41 6177 SOPCZAK CINDY      26 31  .839   6  7  4  5  4  5  51 47  9 11
 42 6178 SKIDMORE BOB       35 45  .778   9  8  5  5  8  2   6 54 11 20 25 33 17 43
 43 6179 SPECK CHERIE       23 28  .821   5  6  3  5  4  5  23 39 41 34
 44 6180 STANICKI SHEILA    29 34  .853   5  6  7  7  4  5  36 45 41 54
 45 6181 STANICKI SHERRY    26 30  .867   5  7  5  5  4  5  36 18 47 14
 46 6182 TOMKO LINDA        14 44  .318   5  7 -2 -3  7  5  36 18  4 54 11 51 19 35 47 28 41 46  4 54 11 51 19 35 41
 47 6183 TAYLOR JOHN        26 42  .619   6  6  3  6  5  2   6 13 36 54 29 39  9 13 48 23 54 17 43 31
 48 6184 VAN HORN DEBBIE    41 45  .911  10  8  9  7  7  5   5 42 54  9
 49 6185 WEBER DEBBIE       36 43  .837   8 10  6  7  5  5  36  4  2 41 13  2 XX
 50 6186 WILSON ERIC        14 31  .452   6  6 -4  3  3  3   1  4 54 51 35 17 39  9  8 49 51

                                   SUBTEST KEY

  ** SCR=SUM OF SUBTESTS ** NF=NUMBER OF FRAMES ATTEMPTED ** 1=STRAIGHT LINE EQUATIONS  ** 2=EVALUATING EXPRESSIONS **

** 3=MULTIPLYING AND FACTORING ** 4=RADICALS AND EXPONENTS ** 5=INEQUALITIES ** 6=RECYCLE CHECK ** RAT=SCR/NF **
```

FIGURE 1

```
   GREG FALLS          YOUR EFFORTS ON TEST M-06 (ALGEBRA 1) HAVE BEEN SCORED AND
   ANALYZED. THE SCORES WHICH YOU OBTAINED ARE LISTED NEXT TO-
   GETHER WITH THE MEANS AND STANDARD DEVIATIONS FOR A REPRE-
   SENTATIVE GROUP OF STUDENTS WITH EXPERIENCE SIMILAR TO YOURS.

                                      YOUR SCORES  MEAN SCORES  STD. DEVIATIONS
   TOTAL SCORE                           36.00        22.40          4.40

   NUMBER OF ITEMS ATTEMPTED             50.00        36.80          6.10

   RATIO SCORE                            0.72         0.65          0.12

       SUBTEST                 KEY            SUBTEST SCORES

   STRAIGHT LINE EQUATIONS     S1        10.00         5.10          2.80
   EVALUATING EXPRESSIONS      S2         6.00         5.80          3.10
   MULTIPLYING AND FACTORING   S3         6.00         4.90          5.10
   RADICALS AND EXPONENTS      S4         9.00         4.30          1.10
   INEQUALITIES                S5         5.00         3.10          1.80

   GREG  , YOU ARE GETTING THE MATERIALS ON THIS TEST UNDER
   REASONABLE CONTROL. YOU ARE DOING ESPECIALLY WELL IN S1.
   EVIDENTLY YOU COULD BENEFIT FROM SOME FURTHER STUDY OF S5.
   SCORING FOR GREG FALLS      COMPLETED
```

FIGURE 2

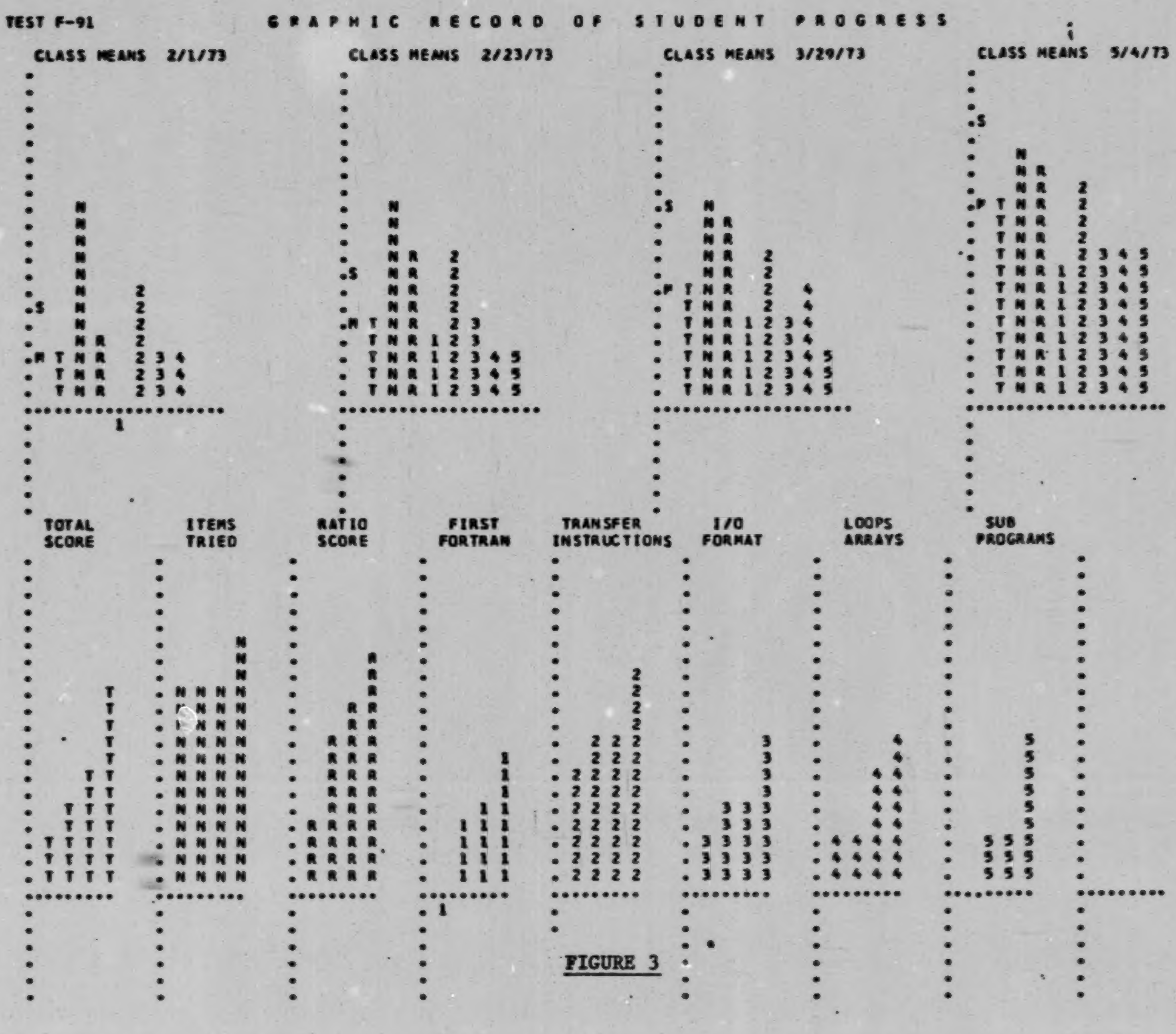

TEST F-91
GRAPHIC RECORD OF STUDENT PROGRESS
CLASS MEANS 2/1/73
CLASS MEANS 2/23/73
CLASS MEANS 3/29/73
CLASS MEANS 5/4/73
TOTAL SCORE
ITEMS TRIED
RATIO SCORE
FIRST FORTRAN
TRANSFER INSTRUCTIONS
I/O FORMAT
LOOPS ARRAYS
SUB PROGRAMS

FIGURE 3

TEST F-91

GRAPHIC RECORD OF STUDENT PROGRESS

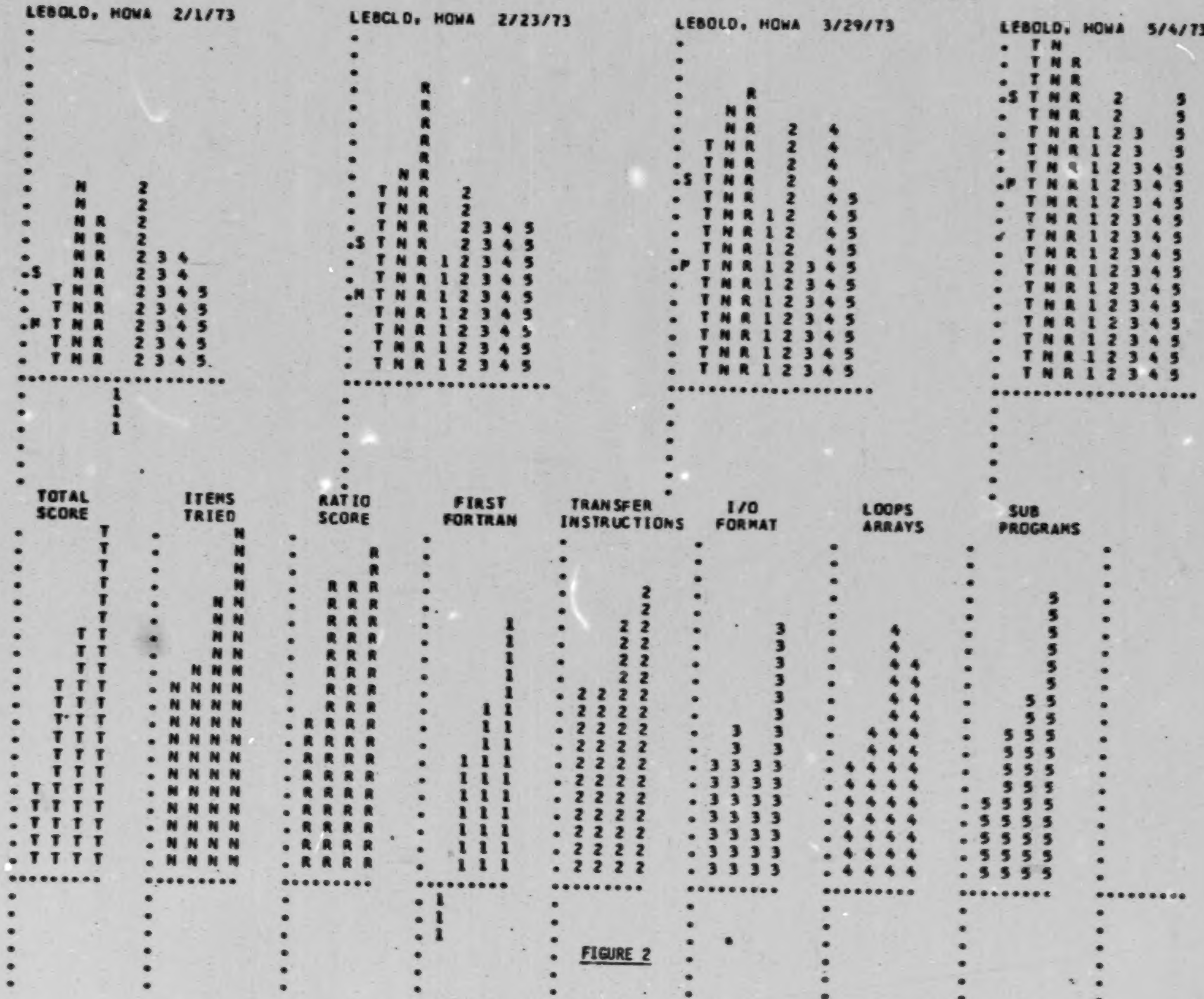


FIGURE 2

A PROGRAM FOR IMPROVING INSTRUCTION

Wayne D. Brunner
Instructional Media Research Unit

The improvement of university instruction is receiving a considerable amount of attention these days-- and deservedly so. There is a great need for improving instruction at the college and university level, and yet very little has been done to develop instructional programs for use by new, inexperienced instructors, or for that matter, experienced instructors who feel their instruction could be improved. The following is a brief description of an effort designed to develop such an instructional program.

A team of Purdue University professors and graduate instructors began in the fall of 1972 to develop a series of 12 minicourses of instructional materials to assist college instructors in upgrading the quality of their teaching skills. The work is supported by a grant from the Exxon Education Foundation. The Project Director is Don L. Tolliver, Head, Instructional Media Research Unit, Purdue University Libraries and Audio-Visual Center. The Project Coordinator is Wayne D. Brunner, also with IMRU.

These minicourses are self-instructional, audio-tutorial packages of materials containing appropriate media. The minicourses consist of a printed study guide and a cassette tape. The tape discusses the particular subject of a given minicourse and leads the learner through the study guide which contains appropriate content activities, examples, and self-tests (for feedback) for the particular content of that minicourse. The purpose of the program is to assist instructors in developing skills in setting objectives for their students, using the various teaching strategies, and evaluating the results of instruction. The minicourses are largely self-contained making it easier for instructors to use them in their offices or home.

These materials have undergone formative evaluation at Purdue University. After completion of the formative evaluation, necessary revisions were made and the minicourses were printed in "first edition" form. The materials are now undergoing summative evaluation, and this should be completed sometime during the spring of 1974. Eventually, it is hoped that these materials will be field tested in universities other than Purdue to insure their usefulness and relevance.

The minicourse materials that have been developed appear to have several viable alternative uses. They may be used in an organized class (perhaps as introductory materials), as an outside assignment for a class, as part of a training program for teaching assistants and new faculty members, or as independent, self-help materials for instructors wishing to improve or enhance their teaching ability.

Included with this paper is a summary of the minicourses which will give interested individuals a more complete idea of the contents of the materials.

EXXON PROJECT - SUMMARY OF MINICOURSES

1. Instructional Model - Donald J. Treffinger

This minicourse provides an overview of a model for systematic instruction. You will consider some of the things which can (and can't) be accomplished by using a model of instruction to guide you in planning or changing your instruction. And you will have some practice in working with each of the general components--or teaching steps--of simple model of instruction...the model which has been used as a framework for developing these minicourses.

2. Behavioral Objectives - Wayne D. Brunner, Purdue University Library

This minicourse describes what behavioral objectives are, how they may be used, and what criteria are necessary for good behavioral objectives. You will also be involved in various activities dealing with behavioral objectives (e.g., writing your own objectives, judging whether objectives meet the criteria specified in this minicourse, etc.)

3. Affective Objectives - Dr. Sam Shermis, Associate Professor of Education

Why did the designers of this package include a section on affective objectives? As you will soon discover, "affective" is a very general term that refers to feelings, emotions, attitudes, and values. Professors do think about their cognitive objectives; that is, they pretty much know what they want their students to know, understand, or realize. However, professors do not spend as much time thinking about how their students should feel. We are assuming that it is not enough for students to know an item of knowledge or to be able to perform a certain skill. The attitudes, feelings, and values which accompany their knowledge and skills are just as important as the cognitive components. This section, therefore, is designed to make you, a college instructor, aware of the complex problems of thinking about feelings.

4. Knowing Students - Ted Walker, Associate Professor of Landscape Architecture, and Dr. Bob Bailey, Professor of Nuclear Engineering

This minicourse gives you a brief exposure to the assessment and/or evaluation of your students. The process involves such factors as the student's physical and intellectual abilities and readiness for the learning experience, and the motivation or appeal which the course holds for him. Hopefully, as a byproduct of looking at the entering students, you may enlarge the understanding of your self as a teacher and find greater satisfaction in your work.

5. Teaching Through Discussion - Dr. Gus Friedrich, Associate Professor of Communication

Discussion in the classroom takes many forms. Some discussions are primarily group problem solving; others are gripe sessions or pep meetings; some provide practice in integrating and applying information gained from textbooks or lectures. Your role as a teacher is often readily definable and concrete in other teaching methods, but it will vary according to the purpose of the discussion; hence, it is in discussion teaching that special training of teachers is most often needed. Most classroom discussions can be classified as developmental; that is, their purpose is to develop a concept and its implications or to solve a problem.

Specific skills are needed for managing such discussions (starting the discussion, asking questions, appraising group progress, and overcoming resistance). This minicourse focuses on a number of such skills.

6. Lecturing as Communication: Problems and Potentialities - (Lecture Package I)
Dr. Rod Hart, Assistant Professor of Communication

The purpose of this minicourse is to remind you of the special strengths and weaknesses of the lecture method of instruction. After considering the unique advantages and disadvantages of lecturing, we'll offer several guidelines to help you determine when lecturing may serve as an effective instructional aid. We will then introduce and discuss a number of communicative dilemmas facing the college lecturer and close by suggesting that an instrumental approach to lecturing may serve to help us deal intelligently with the lecture situation. When you have completed watching and listening to the materials in this package, you may be encouraged to avoid treating your lecturing as "the process whereby the notes of the professor become the notes of the student without going through the minds of either."

7. Lecturing: Overcoming the Barriers to Communication - (Lecture Package II)
Dr. Rod Hart, Assistant Professor of Communication

Despite the numerous lecturing trials and tribulations we discussed in Lecture Package I, you, the instructor, need not throw up your hands in disgust. There are lecture strategies available which you can learn and use in delivering a meaningful and interesting lecture. Many of these communicative resourses will appear to be "common sensical" (sensible because of past experience), but you can do much to improve your classroom instruction if you master them. Thus, to improve your chances of getting through to the dreary-eyed student, you can: (1) select ideas which meet the demands of the lecture situation; (2) develop methods of self-clarification; (3) intensify ideas so as to make the lecture "come alive;" and (4) organize ideas in order to meet students' psychological and intellectual needs.

8. Instructional Technology: Media, Materials, and Methods - Jim Booth

Instructional technology--or media--is a means of enriching the teaching-learning process. In this minicourse we will examine the case for greater use of instructional technology in the classroom, as well as the benefits of technology for the total education process. This minicourse also offers a practical, systematic approach to selecting and preparing media for use in the classroom.

9. Innovations in College Instruction - Donald J. Treffinger, Head, Instructional Media Research Unit

This minicourse provides an overview of some of the important problems and questions which relate to innovation in college teaching. Some general themes or approaches to instructional innovation will be identified and compared. Examples of techniques and instructional programs derived from varying points of view will be described.

You will also have an opportunity to develop criteria for evaluating instructional innovations, and to express your own preferences and assumptions, and to analyze their implications for your own efforts at innovation.

Finally, you will receive some information about additional resources relating to the problems of innovation and change in college instruction.

10. Philosophy of Testing - Lyle Sussman and Warren Seibert

This minicourse emphasizes clear, realistic educational goals in your planning, with teaching and testing methods to match.

Here, you'll learn the nature of this "beast," the test. In succeeding minicourses you'll get a good grounding in putting the test to work so it does the job you want it to.

We'll spend our time in this introductory course looking at two basic types of tests, their differences and functions. After completing this minicourse, you should be able to state the basic difference between these two types and explain their functions. At that point, you'll see that tests need not be born of chance and teacher's whim, and you'll be ready to make your own tests more useful experiences than some you may have been given as a student.

11. A Minicourse in Writing Test Items: Essay versus Objective. Consturcting and Grading Essay Items - Lyle Sussman and Warren Seibert

This course is designed for the new and inexperienced college instructor. It is to demonstrate that good tests don't just "happen." They require concerted effort, imagination, and time, plus an understanding of test construction. This course is to aid you in writing good tests so your hours of preparation will be time well spent.

Upon completing this minicourse you should be able to: (1) explain the major strengths and weaknesses of essay and objective tests; (2) construct and score good essay questions according to the guidelines in the course.

This course concentrates on the dynamics of test construction, taking you through the following steps: (1) preliminary steps in test construction; (2) brief analysis of essay versus objective tests; and (3) how to write and score essay tests.

12. A Minicourse in Writing Test Items: The Objective Test. The Test as a Whole - Lyle Sussman and Warren Seibert

This course is designed for the new and inexperienced college instructor. It is a continuation of the minicourse which compared essay and objective tests, then offered guidance in writing and scoring essay items. As with the preceding course, this experience is to prove that good tests don't just "happen."

Upon completing this course you should be able to: (1) explain the major strengths and weaknesses of the four types of objective tests; (2) construct and grade objective items of the four types in this course; and (3) be able to tell the difference between good and poor test items, whether essay or objective.

A SURVEY OF RUSSIAN CULTURE AND CIVILIZATION

Dr. W. D. Buffington
Assistant Professor of Modern Languages

For the fall and spring semesters of 1973-74, Purdue University made use of the facilities of the local television cable company to broadcast, for the first time, courses designed for the general public. One of the first courses to be broadcast was Russian 590-T A Survey of Russian Culture and Civilization. This course was the product of cooperation among the Division for Continuing Education, the Purdue Telecommunications Center, and the Department of Modern Languages. Russian 590-T consists of 45 taped presentations, each thirty minutes long. Three lectures were broadcast a number of times during each week of the semester. This schedule made it possible for the student to view the programs at times convenient to him and to see the televised presentations more than once if he desired. The course is presented in English. No knowledge of the Russian language is required.

Russian 590-T is a survey course which traces the development of selected aspects of Russian culture and civilization. The course emphasizes the highlights of the story of how Russians have participated in and contributed to the civilization of man. Particular attention is focused on the great monuments in Russian art, architecture, music, folklore, and literature and also on what might be called the "Russian lifestyle," its Russian heritage, and its present-day aspects in the Soviet Union. One of the general purposes of this course is to make the Russian and his background less strange, exotic, or hostile. Through this introduction it is hoped that the viewer would acquire a better understanding of the rich cultural heritage of the Russian and a better understanding of the people who share with Americans the destiny of the Earth.

Several characteristics make Russian 590-T unusual as a course for television.

Its intended audience includes both the undergraduate students from any of the University's schools and the general public. In the latter group are those who are not fulltime students and those who simply wish to learn more about the world. For the first time, use is being made of cable facilities to reach this latter group. Thus Russian 590-T becomes part of that effort of Purdue University to extend learning opportunities beyond the limits of the campus.

The course itself represents a synthesis and modification of courses regularly taught to Russian majors and minors in the Department of Modern Languages. Thus the course was created especially for television and for the broad spectrum of the viewing audience. The wide range of topics allowed the instructor (William Buffington) to select those topics most appropriate for television and to make the fullest possible use of the potential of television. A conscious effort was made to avoid simply televising a lecturer at his desk. To illustrate the major concepts of the course, Mr. Buffington incorporated slides, recordings, filmstrips, posters, pictures, realia from the USSR, and artist's drawings. All these were blended in a way and manner which would be impractical, if not impossible, in the ordinary classroom setting.

As in a television course it is not possible to have the usual kind of interaction between instructor and student, Mr. Buffington believed it necessary to justify the use of television by exploiting what that medium can do with sight and sound to produce memorable effects, to make impressions on the imagination, to stimulate interest in learning more about the subject. Thus visual images, pictures, drawings, realia, etc., were used to illustrate work or music; music and sounds were used for backgrounds for visual images. Each half-hour segment became a unique combination of sight and sound, a montage of effects, all stored on television tape for later rebroadcast. As a book stores the thoughts of the author for retrieval by the reader, each television tape of Russian 590-T has stored the efforts of the instructor for later viewing, thus multiplying manyfold those efforts by making them available to many people at many different time periods.

The student who watches Russian 590-T is also supplied with a course outline and syllabus, which supplies him with text references, an outline of each program, and suggested study questions. At the end of the course, the student may take the final examination for three hours of university credit.

CLINICIAN TRAINING THROUGH A SELF-CONFRONTATION TECHNIQUE

Dianna L. Chalk
Luella K. Glick
Patricia M. Kiser

Instructors, Department of
Audiology and Speech Sciences

A 'population explosion' of students enrolled in Clinical practicum in the Department of Audiology and Speech Sciences precipitated a course of action to alleviate the monumental task of supervising these students. The goal was to improve efficiency without sacrificing the quality of supervision.

In the spring of 1972 a pilot program was initiated in which the students video-taped their own therapy sessions and, through a technique of self-confrontation, evaluated their taped sessions by means of a structured rating sheet. This project was planned and implemented by Dianna Chalk, Patricia Kiser, and Luella Glick who were supervisors of students in their first semester of clinical practicum.

It was anticipated that the trial semester in the self-confrontation technique would

1) teach self-modification and growth in clinical skills;
2) expand to encompass all students within the clinical program;
3) prove to be a timesaving technique which would add valuable hours to supervisors' schedules to accommodate the growing population of students in speech and hearing.

The pilot program was modeled after one developed by Daniel R. Boone, Ph.D., and Thomas E. Prescott, Ph.D., of the University of Denver. The program was modified to fit the needs of the clinical program at Purdue University.

This project involved the purchase of video recording and playback instruments. Two therapy rooms were equipped with permanent installations of these instruments and involved minimal manipulation by the students. Two monitors were installed in a separate area for the viewing of the taped sessions.

Each student was required to purchase a video tape. These tapes were catalogued and contained in a cabinet which was put under security measures to insure the safety of the tapes and of the information which they contained.

The students taped and reviewed one session per week per client. Video-taping and reviewing of the tapes were done according to scheduled times to insure maximum efficiency in the use of equipment.

A rating scale was devised which incorporated ten of the categories outlined by Boone and Prescott. Five of these events were clinician-centered behaviors: explanation, model and/or instruction, good evaluation, bad evaluation, and neutral social response. The five client-centered behaviors were: correct response, incorrect response, inappropriate social, good self-evaluative, and bad self-evaluative. (Appendix A) In the self-confrontation technique employing these categories, the student scored the events of therapy on a work sheet which resulted in a grid depicting the events of therapy sequentially and quantitatively. The clinician computed the ratio of each event to the total therapy time and predetermined sequence counts. (Appendix B) From these ratios they analyzed the appropriateness of the proportion of time spent on each of the occurring events.

After the self-scoring and analysis of the events of therapy, the students submitted the rating sheets to their supervisors for a critical evaluation. Through this method it was possible for the supervisors to determine the appropriateness of the occurring events and to determine if changes were occurring when viewed over a long range.

A one-to-one ratio of direct observation of therapy to video-taped sessions was utlized during the pilot program in an effort to determine individual student's needs for supervision.

After one semester with this program it was possible to determine some positive points to support continued use of the self-confrontation technique through the video-taping of therapy sessions.

Supervisors typically spend approximately 75% of their time in direct supervision. It was estimated that 40% of actual direct supervision (observation) time was saved. However, all of this was not extra time since the organization of the program increased paper work involved in the analyzing of the self-rating sheets, but it did allow for more conference time and the possibility of supervising more students.

A very strong point in favor of the continuation of the program was the independent growth which the students exhibited through the sensitive interpretation of their appropriate and inappropriate behaviors. It was easier for them to modify their behavior when viewed directly.

The success of the pilot program resulted in its expansion and increase of two additional units to encompass all the undergraduate students within the clinical program. This necessitated the purchase of two additional video-recording and playback instruments. At the present time the program is optional for graduate students.

The revision of the philosophy regarding supervision of clinical practicum at Purdue University has been reinforced by the predominantly favorable reaction of the students to this method. The goal to improve efficiency without sacrificing quality has been supported by the independent growth demonstrated by the clinicians through insight developed when confronted by their sessions. This independent growth promoted the efficient use of the supervisor's time in other administrative and clinical tasks.

Appendix A

A TEN CATEGORY SYSTEM

When a therapy session is studied by employing this ten category system, each event of therapy can be categorized into one of ten categories. Each category and its definition is listed below:

Category	1	Explain, Describe	Clinician describes and explains the specific goals or procedures of the session. (Johnny, we are going to use our sound in words today.)
Category	2	Model, Instruction	Clinician specifies client behavior by direct modeling or by specific request. (I'm going to say a word and you say it after me - tiger.)
Category	3	Good Evaluative	Clinician evaluates client response and indicates a verbal or non-verbal approval. (Good, Johnny.)
Category	4	Bad Evaluative	Clinician evaluates client response as incorrect and gives a verbal or non-verbal disapproval. (No, Johnny, let's try it again.)
Category	5	Neutral-Social	Clinician engages in behavior which is not therapy goal oriented. (1. Rearranging material. 2. Did you go to bed early last night?)
Category	6	Correct Response	Client makes a response which is correct for clinician instruction or model. (Client says tiger with correct sound.)
Category	7	Incorrect Response	Client makes incorrect response to clinician instruction or model. (Client says tiger with incorrect sound.)
Category	8	Inappropriate-Social	Client makes response which is not appropriate for session goals. (Oh, that scares me -referring to tiger.)
Category	9	Good Self-Evaluative Elicited	Client indicated awareness of his own correct response when asked. (I got my sound right that time.)
Category	10	Bad Self-Evaluative	Client indicated awareness of his own incorrect response when asked. (I got my sound wrong that time.)

Appendix B

THERAPY RATING SHEET

Therapist: ______________________ Date of Therapy: ______________________ Client: ______________________

CATEGORIES:

	#Events	%Total
1. explain		
2. model		
3. good		
4. bad		
5. social		
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		
6. correct		
7. incorrect		
8. social		
9. good self		
10. bad self		

1. explain		
2. model		
3. good		
4. bad		
5. social		
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		
6. correct		
7. incorrect		
8. social		
9. good self		
10. bad self		

Sequence Counts

Sequence 6 followed by 3

7 followed by 4

8 followed by 1 or 2

Evaluation of Therapy Rating:

INNOVATIVE INSTRUCTIONAL ACTIVITY IN SMALL BUSINESS MANAGEMENT - INDM 583
NEW ENTERPRISES - INDM 584

Dr. A. C. Cooper
Professor of Industrial Management

Student teams develop detailed plans relating to proposed new businesses. These correspond to plans actually developed by many entrepreneurs as they seek to investigate particular business concepts and as they seek to raise venture capital.

Typically, students contact prospective suppliers, customers, professional advisors, and managers and owners of similar businesses. The plans include market appraisals, detailed cost estimates, evaluation of competitors, financial requirements, manpower and special skill needs, and investigation of relevant legal restrictions. Similar businesses in other cities are normally visited.

The first time this assignment was given, a local businessman offered a prize of $100 for the best business plan. Because we are located in a relatively small city and large numbers of students are involved, the range of types of new businesses to be studied is shifted each semester so as to avoid burdening particular segments of the local business community.

The appraisal of this educational activity has been informal, with the instructors believing that the quality of the new business plans was high and with the participating students reporting that "they had never worked so hard, nor learned so much."

The instructor assumes the role of an entrepreneur and the students assume the roles of consultants. (The instructor is intimately familiar with the real entrepreneur's situation, having advised him over a period of time.) As the "consultants" give advice about what information should be obtained and how it should be gathered, the "entrepreneur" compresses the time actually involved and "feeds back" to the class information actually learned about the particular factor under discussion. The class then decides what to do with this information, and in seeking partners and venture capital may have been spread over many months. This role playing exercise compresses the process into a single class and recreates many of the questions which arise as an entrepreneur works with a consultant in trying to develop a new business.

STRATEGIC MANAGEMENT

Dr. Arnold Cooper
Professor of Industrial Management

Dr. Dan Schendel
Associate Professor of Industrial Management

On the premise that managers must work through others and therefore must communicate the results of their analysis, decisions and plans to others before anything further could happen, we undertook to improve such skills for the prospective managers we train.

The basic approach was to have students prepare case material in groups and present their results to their peers in front of video tape equipment.

Each presentation group was placed in competition with another group and peer ratings of the presentation were provided by audience members themselves assigned to groups. The notion of peer group ratings supplemented by instructor critiques provided the student with well validated positions on both his analytical and communication skills.

This general procedure is done in a behavioral laboratory equipped with one-way mirrors which permit unobtrusive taping. The use of several cameras permits audience reactions and presentation alike to be recorded. Split screen techniques can be used to record both simultaneously.

In addition, and perhaps the most interesting feature of the work, playback of the videotape with the instructor and group members present is provided. The opportunity for start and stop with replays to discuss specific points proves to be highly valued by the participants. Their reports of the experience are uniformly favorable and while communication skill improvement is the major gain reported, substantive analytical skills are also sharpened.

While time consuming for student and instructor, and a methodology that requires expensive facilities, it is a novel departure for the student and permits him to observe himself directly while receiving immediate feedback.

MODULAR INSTRUCTION IN INTRODUCING BIOLOGY LABORATORIES

Dr. William Davies
Professor of Biology
Ft. Wayne Campus

Introductory biology courses for non-majors have been structured in module format. Prior to modularization, these courses in botany and general biology were give in traditional laboratory-lecture format, each course arranged in three one-hour lecture and one three-hour laboratory structure. Major examinations were given at three to five week periods. The courses were characterized by high student attrition rates and relatively poor concept retention when measured by comprehensive examinations and unit hourly examinations.

In module format, each course is divided into 15 modules. Each module is based upon a biological principle or concept such as Library Information Retrieval, Energy In, Energy Out, Growth, or Population Dynamics and is one week in duration. Each module consists of related text reading assignments, two one-hour lectures, one one-hour recitation session, one two-hour laboratory, and a concluding one-hour objective examination covering the entire module content. Students may re-take any module examination in which an unsatisfactory score is obtained.

Modules are interchangeable in that they can be given in any sequence and in either introductory course. Examinations are written prior to the beginning of each module. Each module write-up is distributed to students two to four days prior to the module starting date and consists of module objectives, reading assignments, statement of the basic principles to be investigated, the laboratory guidelines, and representative questions. Students evaluate each module experience at its end on a form relative to conceptual presentation, instructor attitude and effectiveness, balance of content in lecture and laboratory, and balance in the examination.

Results thus far indicate the course grade medians have risen one letter grade, student attrition is nil, and students are favorably impressed with the modular approach. Faculty involved find significant improvement in student morale and in long term retention of biological concepts introduced.

A set of problems or questions with answers which are included at the end of each minicourse provide both the student and the instructor with immediate feedback concerning the degree of mastery of the information. In this way, the instructor is able to attend immediately to the specific needs of each student.

One of the recent innovations in the course is the inclusion of computer assisted instructional experiences which require use of the on-line terminal. Three types of CAI experiences have been developed for use so far:

1. Tutorial instruction: programs available for the review of gross human anatomy provide a limited opportunity for dialogue with the computer.
2. Problem solving: programs designed primarily for doing calculations also give students a conceptual understanding of the parameters involved.
3. Gaming: complex situtations require the application of motion concepts for the solution of problems related to human preformance.

The use of CAI experiences in the course have been found to be highly effective in stimulating and sustaining the interest of the students. Current efforts are being directed to developing additional CAI programs designed to meet specific needs of individual students.

COMPUTER-ASSISTED INSTRUCTION FOR PHARMACY STUDENTS

Stephen R. Deiss
Assistant Professor of Computer Instruction

The Purdue University School of Pharmacy and Pharmacal Sciences is using computer-assisted instruction (CAI) to augment classroom instruction and laboratory instruction for large numbers of students from numerous courses. We are using some computer terminals connected to the Purdue Remote On-Line Console System (PROCSY) and some terminals connected to the University of Illinois PLATO IV system developed at the Computer-based Education Research Laboratory. Our largest usage so far has been of the PLATO system with which we are nearing 1000 hours of combined student and instructor contact.

Computer-assisted instruction has enhanced the instructional process in numerous ways. In some classes the students are allowed to use the CAI lessons as a study aid on a voluntary basis. The students use the lessons to provide further explanation of and practice with concepts covered in the classroom. In some cases the lessons provide review and remedial work over material not covered in class. In another capacity, the CAI lessons provide additional material for advanced students to work with beyond what is covered in the classroom. Because of the computer's ability ability to monitor and record performance data for the individual student and its ability to make decisions based upon both recorded data and student preference, the students are allowed to follow numerous paths through the same material. In some classes all students are required to take certain CAI lessons which provide simulations of laboratory experiments. By computer simulation we can provide an artificially ideal environment for experiments th that are difficult or even impossible to implement for students in the laboratory. It also allows the student to use the computer's capacity for data analysis in analyzing the experimental results. For example, the student can interact with simulated patients to determine the effects of various dosages of various drugs in the treatment of different conditions.

Then the computer can help the student interpret the data he has collected by means of various statistical tests. Another usage of CAI that we are developing is as a source of instruction that replaces some portion of what would ordinarily be on-the-job training in hospital wards. By interacting with simulated patients students will go to the job better prepared to interview real patients and interpret their hospital charts. Additional applications of the computer's unique possibilities will be explored as our usage and experience increase.

Our students have reacted to CAI very positively, and in many cases have expressed a desire to use it more in their studies. We currently have five people writing new lesson material for the students, and there are about seven faculty members using CAI in their classes. We have been able to purchase some programs for our use, and we have been able to use a large number of the programs already written for the PLATO system. We are also seeking to join other colleges of Pharmacy in the development of new lessons in order to combine expertise from diverse areas. We have developed about five lessons of our own for the PLATO system so far. In addition to a demonstration lesson there are:

1. a set of practice problems on the factors that influence drug solubility
2. a review of graphing for third year students
3. a simulation of the kinetics of aspirin hydrolysis
4. a simulation of the effect of pH on partition coefficient
5. a lesson chemical structure-activity relationships.

In addition to the increased use of CAI that adding more terminals will permit, we plan to implement some controlled studies of the effectiveness of CAI. We have designed a short course to introduce new lesson programmers to the use of CAI, and demonstration materials have been produced.

COUNSELOR TUTORIAL PROGRAM

Dr. Geraldine Deputy
Assistant Professor of Materials Engineering
Counselor in Department of Freshmen Engineering
Academic Coordinator of the Counselor Tutorial Program

The Counselor Tutorial Program is aimed at helping engineering students who are academically disadvantaged. These students meet the minimum entrance requirements for Purdue and have been admitted to Freshman Engineering. The purpose of the program is to augment the students background in mathematics, chemistry and physics by supplementing their preparatory courses in these areas in order to qualify them for the regular freshman program, which they will begin second semester. Students entering this program usually require three semesters to complete their freshman year.

A list of students eligible for the Counselor Tutorial Program is selected during the early summer, before pre-registration, from the list of beginning students admitted for the fall semester. The present criteria for the selection of students are:

1. The student has been admitted for the fall semester into Freshman Engineering by Purdue University and does meet the minimum entrance requirements.
2. The student has a SAT-Math score of less than 550 or has had no high school trigonometry background.

The students from the list are then interviewed by selected counselors during the "Day on Campus" program for pre-registration. The program is explained individually to the students at this time and the student is told that this program will require an extra semester to complete work towards a B.S. degree in Engineering. Students expressing a strong interest in the program and a commitment to engineering are invited to join the program.

In the summer of '73 approximately four of the 110 students invited to join the program chose not to participate. It was interesting to note that after a few weeks of courses these four students changed their minds about the program.

The students in the Counselor Tutorial Program are enrolled in a three credit hour "Math-Science Problem Solving" course during both the fall and spring semester of their Freshman year. This course meets one hour daily Monday through Friday and requires attendance. The first semester the students are enrolled in one or more preparatory courses in math, physics and/or chemistry. The preparatory courses are at least equivalent to a very good high school course but this credit does not count toward graduation. The second semester the student enrolls in a typical freshman course sequence.

During the first two weeks of the "Math-Science Problem Solving" course the student is taught how to use a slide rule. This intensive two-week slide rule program covers multiplication, division, square and cube roots, squaring and cubing number, trigonometric function and common logarithms. Students may choose to take the slide rule test at any time during these first two weeks, however it is mandatory that all students have passed this test by October 1. Besides just learning to use a slide rule, this tends to give the instructor a way to encourage the student by allowing a "pat on the back" for a success. The third week, the class breaks up into groups specializing in math, chemistry or physics, with approximately 10 students per instructor. Students must rotate from one group to another based on daily need. A copy of the previous year's test is passed out to all students before the first test in each subject, in order to familiarize them with Purdue tests.

The second course in the spring follows the same format of group tutorial assistance five days a week for the first half of the semester. The second half consists of tutorial help for four days per week with tours of the various engineering schools one day per week. This allows the student to see other students working in the laboratories on projects and helps them to make a professional school choice.

Typically the student chooses core A or core B of our plan for the freshmen requirements. MA 161 (Plane Analytic Geometry and Calculus I) and MA 162 (Plane Analytic Geometry and Calculus II) are our typical freshman required math courses. MA 155, 156, 157 sequence is equivalent to the MA 161, 162 sequence just slowed down to three semesters. Physics 470 B and M are not special courses, each are just half of Physics 152 (Mechanics). Chemistry 115 and 116 or CHM 101 and 102 are our regular freshman courses. (See Table 1)

During the spring semesters, some of the students do not continue in the program because they feel that they do not need daily help. They do come in for occasional help for the counselors during office hours. The vacancies are filled by inviting several students who were on probation the first semester to join the program. The program tries to help all of those on probation who really express a desire for help on a regular basis.

It is interesting to note the difference between students who were with the program the first semester, did very well in the preparatory courses, and received an average grade point index approximately equal to the average freshman engineering grade point index when compared with students not in the Counselor Tutorial Program who found themselves on probation after the first semester.

The first group considered themselves successful and this has a very great effect on motivation for attacking the regular freshman courses compared to those on probation who were retaking their courses for the second time. This is where the counseling aspect of the counselor tutorial program is critical.

The current status of past and present counselor tutorial students is summarized below:

	Background					Current Status	
Starting Sem. in C-T	#of Stu.	Avg. SAT-M	Avg. SAT-V	PU Engr*	PU not Engr**	Avg. Tot. Hrs. Cur. Completed	Avg. GPI ***
Fall '71	20	373	463	10	7	69	4.39
Spring '72	17	453	531	8	5	60	4.08
Fall '72	45	387	449	20	10	43	4.46
Spring '73	33	481	569	16	4	35	4.00
Fall '73	94	407	476	81	13	15	4.83
Total	209			135	39		

* PU Engr = no. of students starting in the C-T program that are currently studying engineering at Purdue.

** PU not Engr = no. of students starting in the C-T program that are currently at Purdue in schools other than engr.

*** GPI = grade point index (A = 6.0)

TABLE 1 COUNSELOR TUTORIAL PROGRAM

First Semester Courses

CORE A		CORE B	
(5)	MA 151 (Algebra + Trig)	(5)	MA 155
(1)	ENGR 100: FE Lectures	(1)	ENGR 100: FE Lectures
(3)	ENGR 195B: Ma-Sci Prob Solv I	(3)	ENGR 195B: Prob Solv II
(2/3)	Communication Option	(2/3)	Communication Option
(2/3)	Science Option	(2/3)	Science Option
13-15	CREDITS	13-15	CREDITS

Second Semester Courses

CORE A		CORE B	
(5)	MA 161	(5)	MA 156
(3)	ENGR 195D: Ma-Sci Prob Solv II	(3)	ENGR 195D: Prob Solv II
(2/3)	Communication Option	(2/3)	Communication Option
(2/3)	Elective	(2)	PHYS 470B: Mechanics I
(4)	CHM 101 or 115: Gen. Chem.	(4)	CHM 101 or 115: Gen. Chem.
16-18	CREDITS	16-17	CREDITS

Third Semester Courses

CORE A		CORE B	
(5)	MA 162	(5)	MA 157
(4)	PHYS 152: Mechanics I & II	(2)	PHYS 470M: Mechanics II
(4/3)	CHM 102 or 116: Gen Chem	(4/3)	CHM 102 or 116: Gen Chem
(2/3)	Elective	(2/3)	Elective
		(2/3)	Elective
14-15	CREDITS	14-17	CREDITS

OPTIONS

I. Communications:
- (2-3) ENGL 100 or 101: Engl Comp
- (3) COM 114: Fund. of Speech

II. Science
- (3) CHM 100 or 111: Prep. Chem.
- (2) PHYS 470A: Prep. Physics

TECHNICAL ELECTIVES

(4 hrs. in addition to ENGR 100 are required)

- (1) CHM 116: One excess credit
- (2) ENGR 109C: Intro. Comp. Prog.
- (3) DESIGN 190: Any of the Fresh. Design Courses
- (2) EG 116: Engr. Graphics (if required for your school choice)

TELELECTURE IMPROVES TEACHING

Dr. D. W. Downey
Associate Professor of Agricultural Economics

It has always been a good teaching method to illustrate particular points with experts from industry, government or other institutions. The main problems associated with this were the transportation cost of getting the expert to class, time required on the part of the expert (and therefore unavailability in many cases) and time required in the class (once an expert is present it is difficult to use less than a class period with him).

The telelecture allows the best of both worlds! The guest expert is contacted on the telephone and is interviewed by the instructor during class. The conversation is amplified so that students can hear and take notes. After the interview students have access to telephone handsets allowing them to participate with questions. Therefore, the students benefit from the expert guest. However, costs are low, it doesn't take much of the guest's time and the instructor can easily control the amount of class time used. The telelecture can be ten minutes to reinforce a point or the entire period to explore an area in depth. Also, several experts with different views on a topic can be interviewed during the same period without causing a confrontation.

The student like this method because they hear from top people, participate themselves, and have a fast moving class.

NON-TRADITIONAL INSTRUCTIONAL TECHNIQUES IN HORT 217 - WOODY PLANT MATERIALS

Dr. H. L. Flint
Associate Professor of Horticulture

Non-traditional instructional techniques currently in use in HORT 217 include (a) self-teaching with color slides add typescript, and (b) self-teaching with outdoor laboratories on tape. The "minicourse" approach used may also be considered "non-traditional", even though it is not very new.

Since 1969, most of the subject matter in this course has been organized into week-long segments or "minicourses", each terminated by an hour-long test. In addition, a few special topics are covered outside this framework, and major examinations are also given in the middle and at the end of the semester.

Color slides - About 1200 35mm color slides are available to students: one or two Carousel trays for each weekly segment. Typescript is provided to give the student accessory information. At one time in the past, such information was provided on reel-to-reel tapes. In 1974, a comparison will be made between typed script and cassette tapes to determine student preference and effectiveness of each.

Outdoor laboratories on tape - Even though one weekly formal laboratory, usually outdoors, is scheduled in this course, students have requested the opportunity for more field-work. In response, we have prepared supplementary outdoor laboratories on tape. Students may check out a tape cassette and player, and accompanying map, and following instructions provided take a "self-guided tour" of part of campus or the Horticulture Park, seeing plants of interest in the current instructional segment with additional commentary by the instructor(s). In contrast to most instructional tapes, in which several edited steps are followed, culminating in a "finished" tape, our tapes are made spontaneously (with outlined notes), whenever possible with 2 voices in dialogue. Our object is to maintain a high level of interest, even at the expense of technical perfection. Use of the tapes on an optional basis allows free-market evaluation: i.e. poor tapes will not be used by students, and increases in usage can be attributed at least in part to improvement in content or technique. Each student using a tape is provided a critique sheet and asked to spend 5 minutes completing it. These "crit" sheets have provided considerable information of value in preparing later tapes.

All self-teaching materials are left on file at the Audio-Visuals Center throughout the entire academic year, except for brief removal for editing and additions. We find students in succeeding courses returning to them for occasional review.

Obviously, the success of such instructional methods has hinged upon the excellent facilities and cooperation of the Audio-Visuals Center and its personnel. The help of Dr. Sam Postlethwaite is also gratefully acknowledged.

COMPUTER GRAPHICS IN DESIGN

Dr. Richard E. Garrett
Professor of Mechanical Engineering

This course is intended for advanced undergraduates and graduate students who are interested in the principles of interactive computer graphics and how it relates to design. Some of the topics that are covered are interactive graphical techniques, graphic input devices, graphical display devices, computer-computer interfaces, and computer-machine interfaces. The underlying philosophy of the course centers around visual communication. It has been shown that concepts involving visual communication, an important part of creative thinking, are not given much support in our current educational system. Of special concern to us in design is the use of graphics within the conceptual stages of the engineering design process. The solution to this problem revolves around the capability to teach visual concepts and allow a student to exercise and experiment with these concepts.

An entire computer graphics research laboratory is the vehicle for the course. Equipment available and used in this course includes a large flatbed x-y plotter, graphical input devices (mouse, keyset, tablet, joy-stick), and graphic display computers tied into a PDP-11/40 minicomputer in the lab and a CDC 6500 in the computing center.

The following are two examples of short (10 hour) projects that were done by students and required only a working knowledge of FORTRAN. The first example employs a picture segmentation technique that allows various levels of graphic conceptualization.

The technique of allowing a user to segment the computer displayed picture as it is being created has proven to be very useful. As an example, the sequence shown in Figure 1 illustrates how a picture was developed by making the first quick sketch within one segment (a), and then creating the picture in a new segment directly on top of the sketch (b). Figure 1c shows the way the display screen looks after deleting the first segment.

Figure 2 shows a plot taken right off the graphic screen. This "menu creator" allows the user to sketch an object on the screen with a mouse, using solid lines, blank lines, dotted lines, etc. and then to save a copy of that in a menu. (See top right box) By moving a cursor around with a mouse the user is able to select a new scaling of this figure, reorient it (normal, mirror, upside down, upside down-mirror), and position copies of it anywhere on the screen. Figure 3 shows how a dynamic system model can be sketched by creating a similar menu. An important thing to remember her is that the student is writing interactive graphic programs with only a knowledge of FORTRAN.

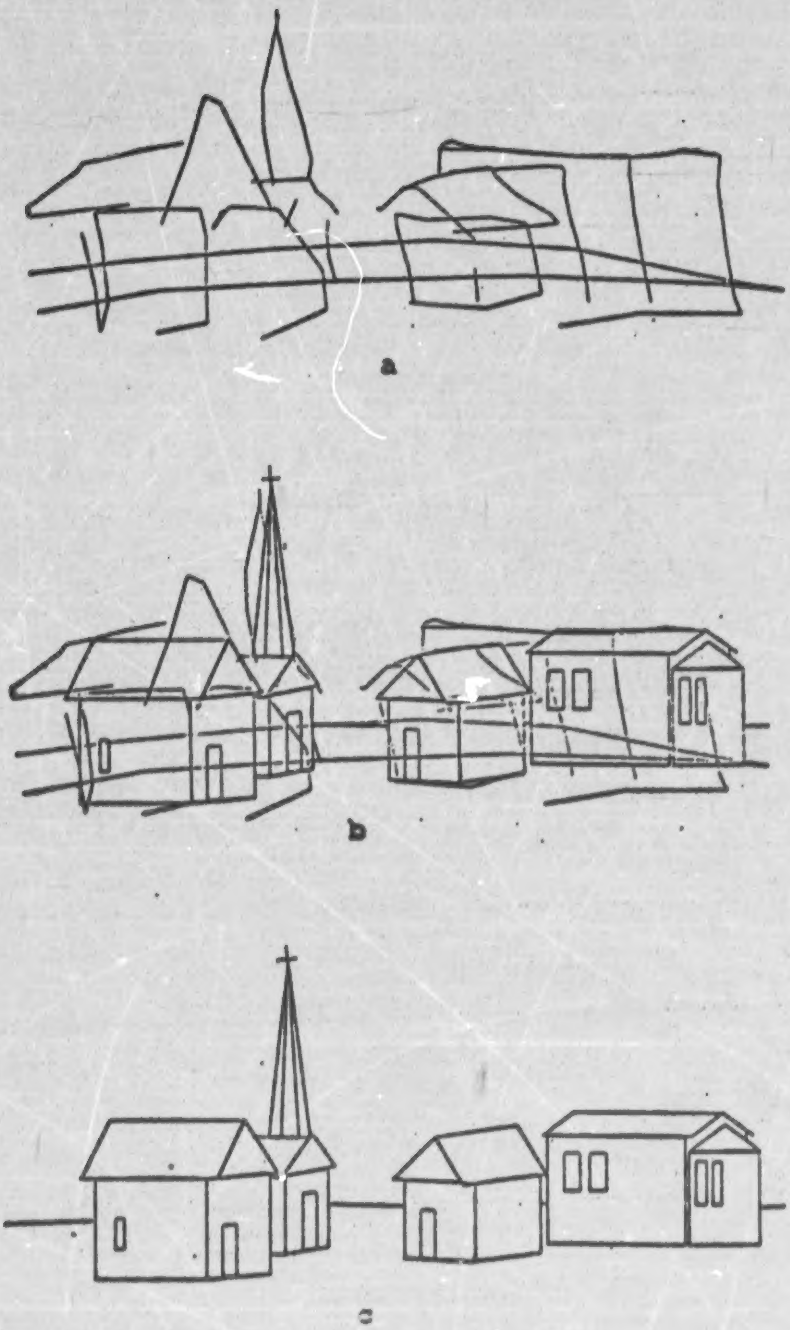


Figure 1 Three Views in Development of Picture

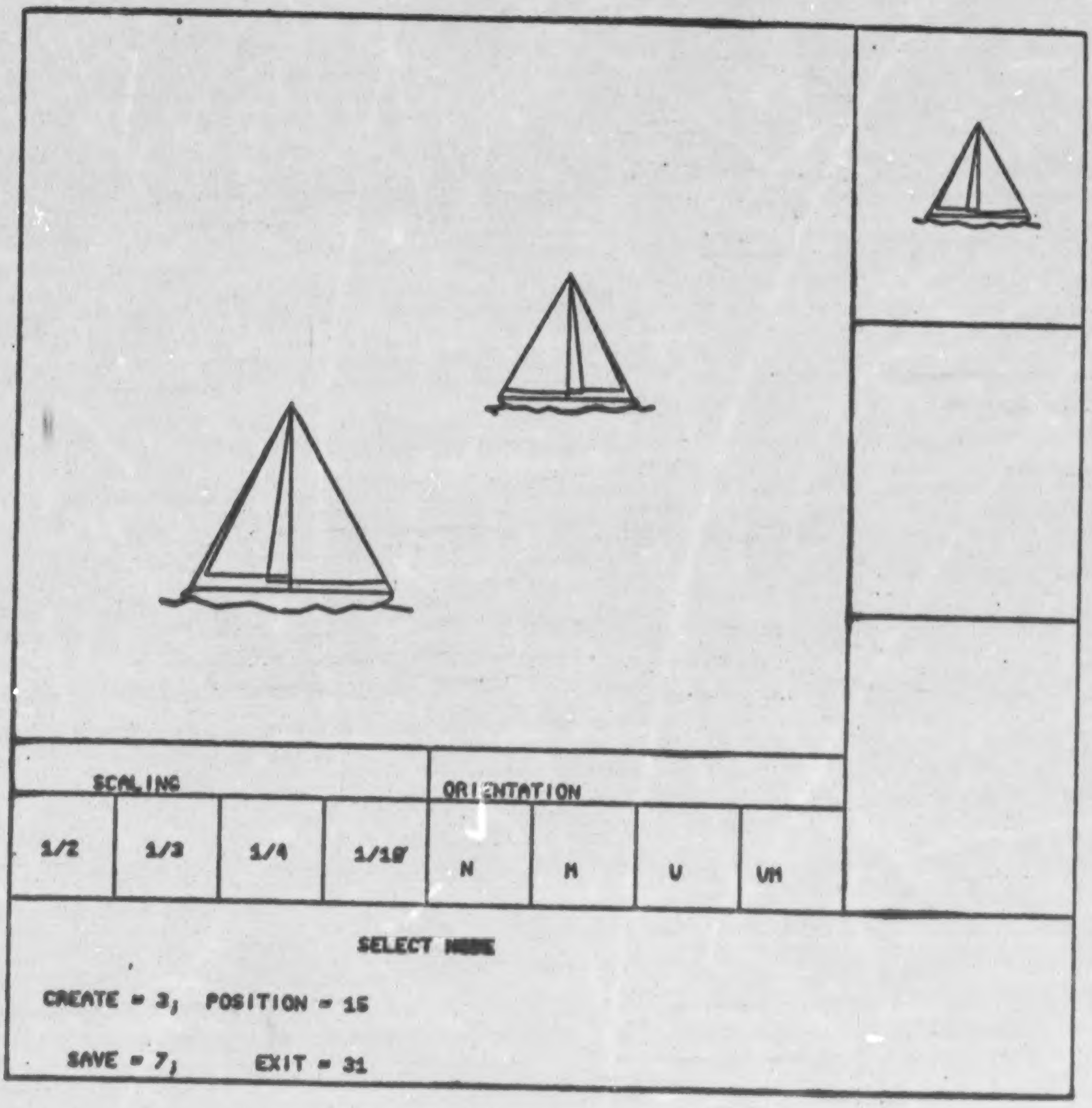
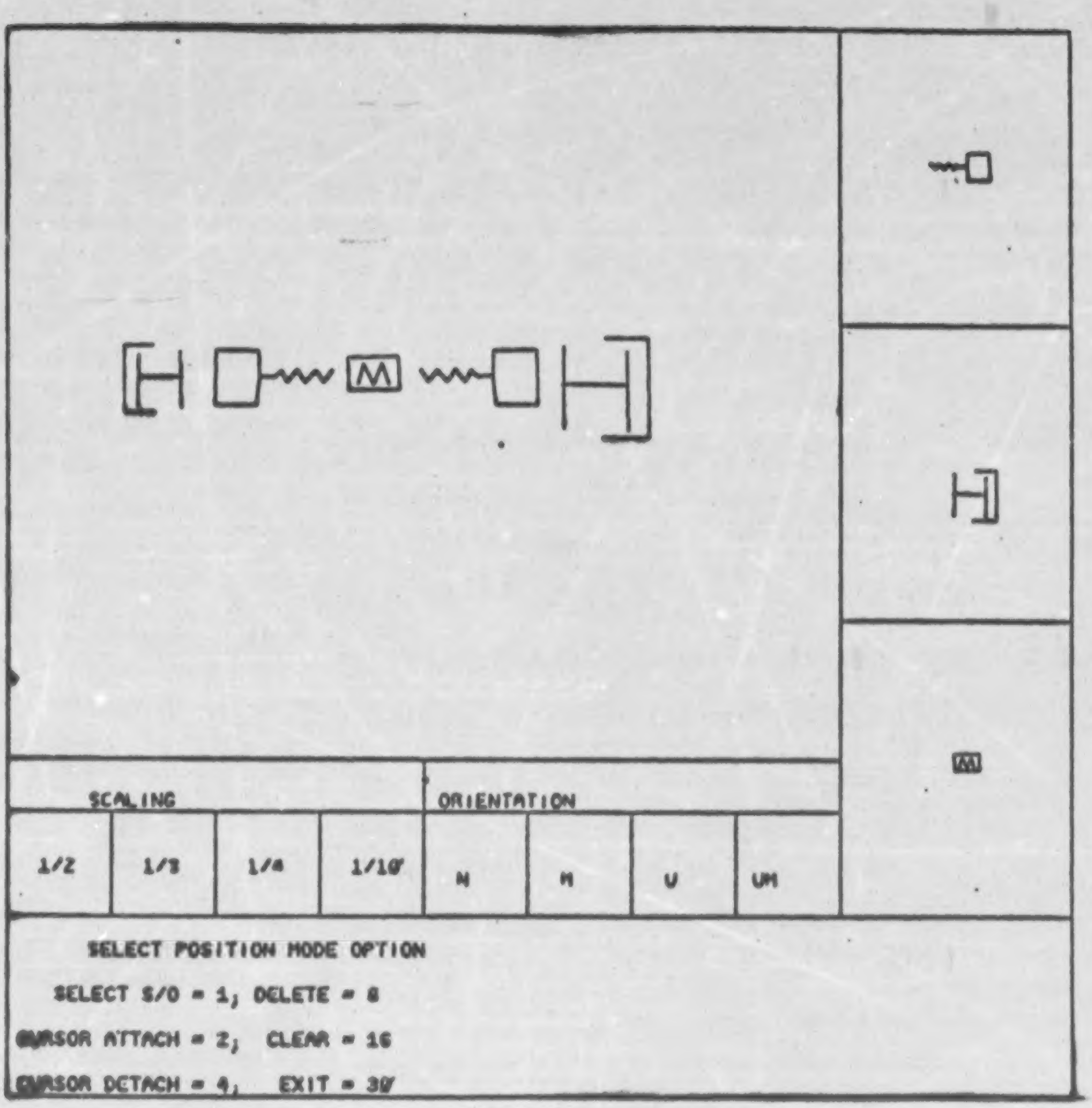

SCALING
1/2
1/3
1/4
1/10
ORIENTATION
N
M
U
UM
SELECT MODE
CREATE = 3; POSITION = 15
SAVE = 7; EXIT = 31

Figure 2 A Menu Creator: Sailboats


SCALING
1/2
1/3
1/4
1/10
ORIENTATION
H
M
V
VM

```
     SELECT POSITION MODE OPTION
   SELECT S/O = 1, DELETE = 8
CURSOR ATTACH = 2,  CLEAR = 16
CURSOR DETACH = 4,   EXIT = 30
```

Figure 3   A Menu Creator: Dynamic Systems

COMPUTER GRAPHICS: A SYSTEMATIC APPROACH TO DESIGN

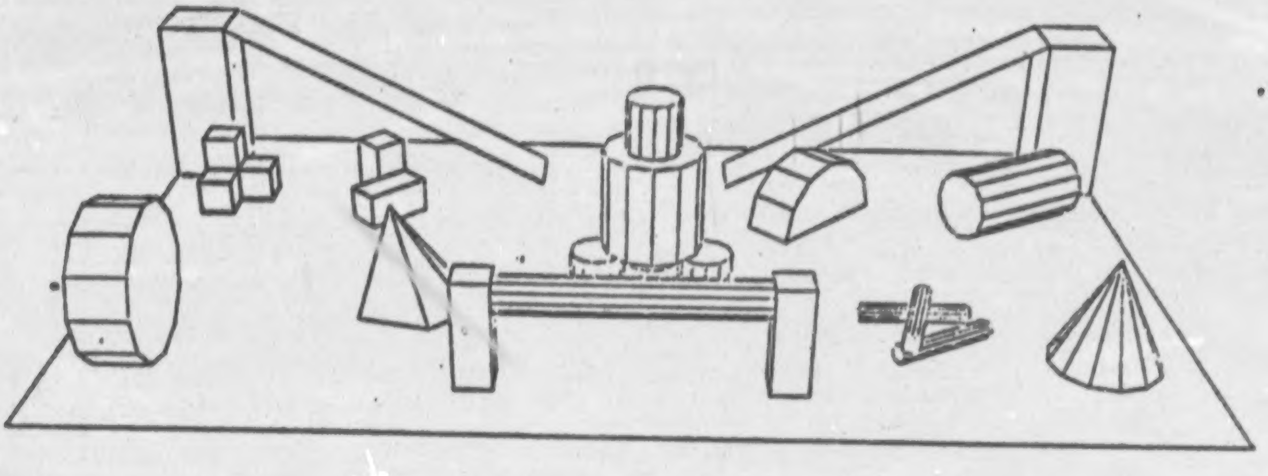
Dr. Richard Garrett
Professor of Mechanical Engineering

James J. Lesko
Assistant Professor of Art and Design

This course is an experimental course offered by Mechanical Engineering and has been successful in attracting students from both engineering and the humanities. It is intended for (but not limited to) undergraduate students who are interested in cultivating a feeling for adventure in design by exploring some of the latest technical and conceptual innovations in computer graphics. In this course professors from Engineering and Creative Arts attempt to go beyond the use of computer graphics as a powerful analytical tool and instructional aid, to using this visual phenomenon as an intrinsic tool in the systematic approach to modular design. Emphasis is placed on procedural "rules" in the design process in contrast to purely intuitive methods. Projects include individual computer graphic designs, two dimensional designs and three dimensional models. An example of an individual project is shown in Figure 1, A Computer Designed Play Environment. This three dimensional, hidden line, perspective, composite object was done by a student from Women's Physical Education. Actual models can be constructed by using a sophisticated developed view program.

During the course, the class will participate in a group project where a 3-D model will be designed and built in a large scale. This project along with the individual creative drawings generated throughout the semester, will be exhibited in "Gallery ME," a show inspired by this course.

Figure 1. A Computer Designed Play Environment



TEACHING FRESHMAN ENGLISH COMPOSITION: ENGLISH 100

Dr. Laverne Gonzales
Assistant Professor of English

Offered on the Purdue Lafayette campus since the Fall of 1970, English 100, a developmental program in English Composition, has functioned as a growth center for students with low SAT verbal scores. Currently about one half of our students are either black or of Spanish descent; the remainder are largely typical middle class Americans. Meeting five days a week, the course operates almost on a tutorial basis with fifteen students composing a class. This highly individualized course starts where the student is and moves according to his needs and interests; thus the major part of the material used evolves from the class itself. Consequently the course has become largely self-generating. Since the object of English 100 is dual: to bring the student to college competence in writing and to encourage the student to use his writing as an expression of himself as a person and as a student, total respect for student expression distinguishes the course. The student has at once freedom to find his own voice and discipline to discover more professional craft to supplement his already considerable language skills. A person learns to write by writing, and a person who writes is by definition a writer; therefore students approach writing as professional writers.

Although the very nature of the course demands that no two courses will ever be the same, basic techniques are encouraged. Broadly the catagories of the writing experience are: psychological preparation, journal keeping, peer criticism, revision and editing, publication. Every week we publish a newspaper Easy Writers and once a year we publish a book, Since You Asked Me, of the best writing produced that year. These publications have in the past enjoyed a wide circulation both on our own campus and in other universities.

Psychological Preparation

The teacher provides most of this with stimuli, prompted by the students' writings and by annotating papers to encourage rather than discourage the writer. Grades are usually given only at the end of the semester.

Journal Keeping

A class journal as well as personal journals are kept. Here the student records ideas, captures a moment, plays with words, writes a poem, soars or sinks. The journal contains the seeds of all future papers. The responsibility of the teacher here is exposure. The beginner writer must submit himself to a variety of experiences - recording his immediate responses then deliberately determining what factors both inside and out caused his response. He digs deeply into himself at this level. The teacher begins the exposure process with interests emerging in the free writing. An important prerequisite emerges; the teacher must be alert, receptive, and informed. A free interexchange of ideas between all teachers involved becomes mandatory. Students will assume ethnic roles, write drama script, demonstrate. One student wrote a drama, Oreo, which so excited her peers that they learned the parts and performed it in Fowler Hall. One class developed an experimental film which they have set to various musical background, examining changes in their reactions. Music may often permeate the classroom. The teacher accompanies exposure to building - huge auditoriums, tiny pinball hang-outs, closed chemistry laboratories - with the admonition, "See with the mind, expose all the senses, feel to the very end of the fingernails." Record details sitting in a room looking out, on the ground looking around, interviewing people, observing people by climbing into their minds and writing interior monologues. Slowly the teacher enables the student to see his own mental processes and to transfer these to his writing. The mind collects an infinitude of material, catagorizes, stores it, generalizes, sends out orders to the body based on these generalizations. In the observing process the students are creating their own materials. Then as papers begin to take shape, the students who have met daily in many kinds of verbal and social exchanges read their writings to each other. Scoping ideas for further insight led a class to spend an hour outside one day discovering all the variations of the verb "walk" being demonstrated. All of the material goes into a portfolio.

Peer Criticism

Works-in-progress are submitted to three or four peers, whereupon criticism begins. Early criticism notes merely response to an idea - if as the author reads he triggers a thought, the listener verbalizes it. Then packed sentences, strong use of verb, exciting metaphor, vivid comparison/contrast, unusual definition receive praise. Critics investigate possible irony or larger idea. Before any cutting away may be done, strengths emerge - the dross may then be sloughed off in the revision process. As papers continue to be submitted for peer criticism, the students begin to set the criteria for tougher criticism. The author offers a paper deemed ready for publication to a peer group whose members write on a cover sheet those places where the paper still needs work. Finally the group scrutinizes beginnings, endings, and implications of the paper. As students look thus critically at their own writing, they often begin to review critically advertisements, the rhetorical garbage used by highly emotional authors, and at last to produce sound critical writing of material included in the newspaper.

Revision and Editing

Before any paper may be published, it must undergo revision and editing. To help with this process proofreading quickies i.e., three or four sentences lifted from students' papers focusing on punctuation, verb/noun/pronoun agreement, spelling or any grammar problem are reviewed daily. Sometimes a particularly troublesome spot will elicit several days work on a grammar concept. Each student keeps his own grammar charts which allow him to concentrate on any recurring problem. From this particular facet of the course a slide set on punctuation using the analogy of a train evolved. Grammar books appear, composed of dittoed material developed by each student. Exercises created by class members driving home a point are administered. When the matorial demands a specific rhetorical form or a specific tone, students work it through together.

Publication

The final and yet paradoxically the beginning step is publication in the newspaper Easy Writers. The publication is uncensored; a student publishes what he wishes, but a space for criticism is provided. No student may publish annonymously --

every student must accept the responsibility for his idea. He may, of course, respond to the criticism -- an argument on abortion may go on for weeks. Each teacher publishes a brief explanation so that other classes may know what prompted the writing. Although the criticism often begins on a personal level - later criticism becomes objective therefore most effective. As students work with language, they begin to replace the evocative but ineffective "shit" with details that produced the comment - finally shit is a cop-out employed when the author refuses to fill in the details. The newspaper is not the finished product, it is a teaching tool - since students learn printing does not make an article profound or even correct - critical thinking, the crying need of a student, becomes mandatory. As the course progresses the newspaper feeds the course. At the beginning, writing is autobiographical truth, then a sensitive author draws back one step, replacing the I with he or she. Finally pieces which began as a personal response produce objective papers which argue a point or criticize a value.

We do have a few tangible "proofs" of the success of the program. Of course statistics are meaningless except as they are translated into specific individual achievement. Whether or not the program really succeeded depends wholly on whether or not the participating students' lives were significantly changed by this experience. That evaluation can only be given after much time has elapsed. However, the results of one test done in 1971 showed that on an average a student improved from a D+ to a B- for a 3.85 increase, which may be interpreted as a reliable gain since correlation between judges was moderate to high. Only two of the forty-seven black humanities were on probation that semester, whereas in 1969, out of thirty-seven, four were on probation. Four students left, but for personal reasons, not financial or academic. The average index for black students in 1968 was 4.14; in 1969, 4.2; and in 1970, 4.4. In English 100, the index was 5.25 as compared to the 1969 English 101 index of 4.36. The English 100 percentages were A - 39%, B - 43%, C - 10%, Inc. - 8%. Most of the students have gone on to 101, some to 102, a few to 103. Some engineers received their English credit and were dismissed from further English. Several students have been assigned to special creative writing courses. So this year, 1974, we have students who began in 1970 graduating. Of that first group of 158 students, 118 are still at the university!

To date, grammar handbooks and filmstrips, a video tape on Education, slides and recordings, as well as a drama have been produced. Because the group progresses according to the student-need-and-interest one semester the work may be predominately grammar, another detail recognition and use, another rhetorical forms. One student handed in his journal punched out on computer cards. Our students have been uniquely successful at the University since the course allows both for student as well as teacher creativity. Philip Warren took the President Hovde literary award; Lettice Otero organized ALAS; Greg Wiltrout is business manager of the Exponent; Annette Lenoir writes poetry for the Black Cultural Newsletter; and I have only just begun. Remember these are students who probably would not even have been admitted to the University.

Teachers ask to teach the course. Students say it is the best course they've ever had "bar none." Parents write, "Why can't student have more courses like this?" Educators and authors, Hans Guth and Ken Macrorie, have published praise of the course as a most successful, unique, and humanitarian approach to the teaching of English Composition. But the best proof of the value of the course is when former students demand our weekly newspaper, Easy Writers to be sent to them.

THE "MAN SERIES"
A SUITE OF INTERDISCIPLINARY COURSES

Dr. Richard E. Grace, Head and Professor
Division of Interdisciplinary Engineering Studies

A new suite of eleven courses, known as the "Man Series," is being offered to Purdue University students. The series of courses emphasizes a blend of the social sciences, industrial management, and engineering into a new relationship dealing with human values.

Development of the "Man Series" has been made possible under a two-year, $315,000 grant from the Alfred P. Sloan Foundation, New York, made in March 1973, "for support of a new program directed toward extending the social dimensions of professional engineering education."

The faculties of the School of Humanities, Social Science and Education, the School of Industrial Management, and the Schools of Engineering have been working closely together to make the new suite of courses possible. Faculty teams range from two to six; each team is developing and offering a team-taught, interdisciplinary approach to a different aspect of technology's role in creating and relieving major social problems.

The titles include the following:

MAN, AESTHETICS AND PUBLIC WORKS
MAN AND ENERGY
MAN AND HEALTH CARE
MAN AND LAW ENFORCEMENT
MAN AND HIS FOOD

MAN AND HIS MODELS
MAN AND HIS ENVIRONMENT
MAN AND TRANSPORTATION
MAN AS ENGINEER IN HISTORY
MAN, HUMAN VALUES, AND THE WORK ETHIC
TECHNOLOGY AND VALUES

The general purpose of the courses is to broaden the undergraduate engineer's awareness of technology's role and impact on society. The courses serve a similar purpose for the non-engineering student.

Not surprisingly, a number of the faculty not only are cooperating across departmental lines for the first time, but they are meeting new colleagues as well. Each faculty group decides upon the format which presents their topics most effectively: lectures, discussions, special case or project studies, computer simulations, slide presentations, or combinations of any of these.

A working committee of all professors who participate in the series meets two to three times per semester. In addition a small steering committee serves to set tone, screen unusual requests, and prepare the agenda for the working committee meetings.

While it is too early to judge the impact of the series, several things have been noted: Aproximately 350 students enrolled in the first eight courses, the faculty teams are cooperating effectively, important new concerns are being incorporated in the curricula for engineers and non-engineers alike, and the attractiveness of the courses for non-engineers alike, has been greater than expected. Extensive evaluation is being carried out by the Engineering Education Research Unit, which is monitoring all the courses.

For additional information, contact Professor Richard E. Grace, Head, Division of Interdisciplinary Engineering Studies, AAES 140, Purdue University, West Lafayette, Indiana 47907.

VIDEO CASSETTE PLAYER USE IN AGRICULTURAL ENGINEERING COURSES

Dr. L. F. Huggins and Dr. R. M. Peart
Professors of Agricultural Engineering

The video cassette player-recorder is currently scheduled to introduce students to computing facilities and techniques. Future uses are planned to include instruction in testing of biological materials, environmental effects on stored grain and possibly use of power and energy measurement equipment. Currently, only a test tape has been produced, but plans are underway for production of tapes to show students the various digital computing terminals and how to operate them. A surplus black-and-white video receiver has been connected to the tape player and mounted on a rolling cart for use in various rooms. Black-and-white is useable for some learning tasks, but for analog computer programming, color will be necessary. The analog patching panel has meaningful color coding that is important in learning programming, so plans envision color movies converted to color tapes which can be used on the present black-and-white monitor until an inexpensive color monitor can be obtained.

The beginning troubles for students learning computer applications in agricultural engineering are rather simple, "How do I switch it on?", "What do I do when I make an error?". These seem trivial once some experience is gained, but the visual instructions, available on a one-to-one basis and when the student needs it are very important at this point. The student can run the tape to just the section he wants, he can back it up and re-play to make sure of a certain point, and it is almost like having the instructor available.

These tapes are still in the planning stage, but should be in full operation in the Fall of 1974, after trial use this Spring.

PROJECTS IN HOUSE DESIGN

Dr. Marjorie Inman
Assistant Professor of
Equipment and Family Housing

Projects in House Design is a senior course developed to meet the need for a professional course offering realistic experience.

The entire class structure of Projects in House Design is based on field projects in house design and remodeling. An introductory project from a previous semester's client gives students a base on which to focus during the rest of the semester when they deal with actual clients in the surrounding Lafayette area. The beginning project integrates work from previous courses so they will be prepared to use this knowledge in dealing with and designing for clients during the rest of the course.

During the client-student experiences, which cover twelve weeks, each student is exposed to approximately eight remodeling and new design projects. All students make contact with each of the families involved, visit the site of the future building project, and then submit sketch ideas concerning the problem. The clients critique the students' preliminary designs, following which each student selects the project to work on in detail. This is repeated for a second project. Further contact with their assigned clients enable students to better fit the project designs to the needs of the family involved. Each client receives two or three student solutions to their problem.

For the introductory project and the two client projects, students produce full sets of blueprints including floor plans, wiring diagrams, plot plans, foundation plans, roof plans, elevations, and detailed cross-sections of specific areas. Perspective drawings and renderings of remodeled areas, a list of materials specifications, and project costs are also an important part of the students' work. Clients receive a complete copy of each solution to their problem.

MASTERY-BASE PERSONALIZED INSTRUCTION IN PHARMACOLOGY

Anne M. Keuhnelian
Instructor in Chemistry and Pharmacology
Fort Wayne Campus

As I began to think about the traditional grading system as applied to pharmacology taught to nursing students I began to seriously question its validity. Norm reference exams meant that students knew more than, as much as, or less than their average classmate but had little to do with how much actual usable knowledge of pharmacology they had acquired. Further, I was not at all sure I wanted a student with even a C under that system, much less a D, responsible for my medication were I to be hospitalized. I decided some changes were in order.

The course had been given in the traditional manner in the spring of 1972 and 1973 to classes of 200 nursing students, Licensed Practical Nurses and LPN students. By spring of 1973 it was also a free elective for respiratory therapy, emergency medical technology, and medical technology students. The summer of 1973 class was of similar composition. The change in philosophy and, consequently, format was made for the summer 1973 class and the comparison of results made here is between the two summer classes.

Lecture notes were prepared for the students to purchase, thus freeing classroom time for explanation and discussion rather than the giving and copying down of information. Pharmacology is not a theoretical science; student must learn how to use information in a clinical situation. (What had been lacking in the more formal course was sufficient time to learn and to discuss how to apply theory to solve the problems). In a clinical situation memorization of facts is useless unless that information can be applied. Further it is impossible to memorize all one needs to know to administer all drugs safely; a knowledge of what primary reference to go to for the information is essential.

The library played a major role in the redesigning of the course. Selective purchasing of materials in pharmacology was done out of both departmental and reference funds. These materials were placed on Reserve for student use and each student is provided a list of these materials. Therefore, the course could be designed to give the students the problem and make them hunt for the solution. They are required to find and sort the information, learning to recognize valid material while rejecting inferior sources. This had to be compiled in precise form and would become automatic by repetition of the process. At first the instructor in class must provide considerable discussion and help, but over the semester less and less is such direction either needed or desirable.

In preparation for the course, the library staff has undertaken orientation of all students to its services. In groups of ten they receive a three part orientation: 1) a general slide/tape presentation showing the physical aspects of the library as well as brief instruction on the use of such resources as the card catalog and periodical indexes, 2) a three page guide to use of the library, 3) a bibliographic tour which indicates materials on Reserve, use and location of the card catalog, periodical indexes, and reference books in their subject area. A five-question quiz, distributed at the conclusion of the tour, allows the professor to check the students' grasp of the information and the library to check the strengths and weaknesses of the orientation.

A traditional unit breakdown of course content was maintained. Principles, central nervous system and its drugs, autonomic nervous system and its drugs, diuretics and cardiovascular disease mangement, and antiinfective and antineoplastic therapy are covered in that order. A sixth unit may be chosen by the student covering an area of his unique interest. This allows a non-nursing student to investigate drugs in the areas in which he will be seeing them. It also allows nursing students to specialize in a particular area, since many have already decided on a field of specialization. This unit must be researched by the student and include behavioral objectives (against which the rest of his work is graded), tasks performed, bibliography, and research report. Each unit requires some library work even of the C student and more if the student desires a higher grade. A cover sheet is provided with the notes for each unit listing unit objectives, tasks to be performed to complete the unit, where reading material can be found in the primary reference sources for the unit, and a list of projects (or problems) which a student can choose to research and solve.***

*** Examples of these projects are: Principles Unit - read *Psychology Today*, V.5 #4 September 1974, p. 16 and V.4 #12 May 1971, p.31 and react, Brouse *Remington's Pharmaceutical Sciences, 14th Edition* to ascertain the depth and diversity of material involved in pharmaceutical sciences; Central Nervous System Unit -Compare descriptions of APC's Phenaphen^R and Darvon^R in *AMA Drug Evaluation* and the *Physicians Desk Reference* and draw appropriate conclusions, Evaluate the question "Are over-the-counter sleeping medications effective?"; Autonomic Nervous System Unit - Using *Hazards of Medication* and *AMA Drug Evaluation*, investigate the sympathomimetic amines for use in over-the-counter medications; Diuretic and Cardiovascular Unit - Treatment of peripheral Vascular disease, Items and Drugs found on Hospital Emergency Carts and Why?; Antiinfective and Antineoplastic Unit - Read the unit in *Drugs of Choice* on Cancer and its Chemical treatment and respond, Respond to the question "How effective are the over-the-counter topical antibacterials? and recommend the best to a mother of young children.

One of the requirements for each unit 2-6 is a set of drug cards. These are divided into two types; a classification card which must give mode of action, therapeutic effect, clinical uses, side effects and toxicities, contraindications and cautions (the nursing faculty have the students add nursing implications); and individual drug cards which must give class of drug, primary clinical uses, any unique information not given on classification card, and dose form and range.

In addition [illegible] the drug cards, unit projects, and student-researched unit, two take-home final exams are administered. One consists of clinical problems listing diagnosis for a patient and drugs administered. The student must give classification of drug, use for that patient, and relationship to other drugs given. The other is a six-page research report on a particular patient and his drugs. This must cover in depth the same type material as the assigned clinical problems. A student is encouraged to take a patient with whom he has had to deal in other courses, i.e. nursing care studies, and in his particular area of interest. The research report may be an in-depth study of drugs in a particular field of the student's major where he is not a nursing student. The final exams are designed not to test memory or ability to cram but use of material covered in the course and the student's ability to find in primary reference materials the answers to the questions he must answer.

Evaluation of all of this material is either "all or none", that is, either the student's work meets acceptable standards and receives full credit for it or it is returned to him to correct and resubmit. This allows valuable work to be assigned without the problem of subjective evaluation of quality above minimum standards.

It allows a student the valuable experience of doing the work correctly; when he learns is really immaterial as long as he learns.

However, exams are graded on points correct and the actual score is recorded. In the redesigned course the exams are criterion referenced and designed to test the student's mastery of the unit objectives. Seventy (70) per cent of each unit is the minimal acceptable score for the unit. Any unit score below that must be retaken; one or more unacceptable units constitutes a grade of Incomplete. Thus, a course grade of C means that a student has met the minimum performance on course objectives and knows a satisfactory amount of pharmacology to function adequately in a clinical situation. Mastery of a unit is set at 85%. Mastery must be obtained on each unit for a course grade of B or A. This indicates superior work and the distinction between the two grades is obtained through the number of unit projects, reflecting a student's increased interest, willingness to spend time with, and broadened knowledge of application of material beyond the minimum required.

Conference with the nursing faculties of the schools involved indicate that in fact the student do know pharmacology and can use it in the clinical situation more adequately if they have taken the restructured course rather than the traditional one. Student evaluations in the traditional program indicated interest in a course so restructured; in the restructured course they indicated its value to them, even through the work load is higher. When asked if they prefer less work and a traditional course the unanimous response was "NO".

Perhaps the most significant result, however, is the grade situation. Comparing the two courses of similar student composition and size, the drop rate and the rate receiving incompletes are comparable; the number receiving A or B is significantly higher in the restructured course even though the requirements for the attainment of those grades is also significantly higher. (See table 1 and 2).

TABLE I

Course Statistics	Summer 1972	Summer 1973
Total number of students	16	21
Number of students completing the course	12	15
Number of students erasing incomplete	1	1
Number of A's	5	8
Number of B's	3	4
Number of C's	3	0
Drops after two weeks	3	0
Incompletes	0	5

TABLE II

Percentage of students completing the course to receive grade.

	Summer 1972	Summer 1973
A	38	50
B	23	25
C	38	25

INDUSTRIAL MARKETING: STRATEGY AND TACTICS

Dr. Charles W. King
Associate Professor of
Industrial Management

Course Overview

The course, Industrial Marketing: Strategy and Tactics, has been designed to present a unique blend of strategy conceptualization and pragmatic, tactical, "how to" implementation in the context of industrial marketing. Organizationally, the course is built around two basic content blocks:

I. Industrial Marketing: Strategy and Tactics -- A review of the basic elements of industrial marketing and marketing decision making within that environment.

II. The Dynamics of Negotiation: Theory and Practice of the Art -- Basic concepts of "negotiation theory" are presented. Class participants apply the concepts in actual "one-on-one" negotiation exercises within the industrial marketing context involving video taping and self, group and instructor critiques. Additionally, each student organizes a self improvement plan to follow after the course.

Conceptually, Block I is intended to define the industrial marketing environment in which the marketer operates. Because much of industrial marketing ultimately focuses on a "one-on-one" negotiated "sale," development of effective negotiating skill is essential to managerial success in this field.

Block II, therefore, is intended to present basic concepts of negotiating and give the student the opportunity to develop "paint-by-number" understanding and tactical competence in negotiating.

Programatically, IA 623, is part of the marketing sequence of electives in the Krannert Program. Pragmatically, major substantive emphasis is placed on the skills of negotiating which have applicability in a variety of interpersonal interactions. In this course, those skills are applied within the context of industrial marketing negotiation situations.

Course Content: Detail

A detailed outline of the course by major content module is presented as Exhibit I for interested students.

Teaching Format

A variety of teaching techniques will be used. These include:

1) Formal concept lectures, lecturettes and class discussions;
2) Filmed cases;
3) Directed interpersonal interaction exercises;
4) Structured self analysis of negotiating skills and self critiques of performance in the negotiating excercises;
5) Small group critique of individual negotiating performance;
6) Class critique of video-taped executive and class negotiating sessions;
7) Standard class case discussions;
8) Assigned textbook and selected article reading.

As much "live" video taped negotiating experience will be scheduled into the course as practical depending on final class size and laboratory equipment availability.

Dimensions of Teaching Innovation

The basic conceptual material dealing with the substantive area of industrial marketing, the behavioral dimensions of buyer-seller interactions and the theory of negotiating is treated in the traditional manner using routine lecture/lecturette with class discussion and the case method of problem solving.

The dimensions of teaching innovativeness centers on intensive student involvement in applying the basic negotiating concepts through planning and conducting actual negotiating sessions followed by intensive self critiques, small peer group critiques and instructor critiques. Mechanically, a typical negotiating excercise involves:

1) Class discussion of an industrial marketing negotiating situation. The discussion centers exclusively on familiarization with the case facts;
2) Each student is then given a role as buyer or seller in the case. Once the role is assigned, the student is given the "company confidential" information he would have, e.g. price/cost ranges, corporate objectives and constraints, etc. which his adversary would not have.
3) Each student then prepares a "negotiation plan" for dealing with his adversary in a face-to-face interaction The student is required to complete a detailed form outlining objectives, tactics for interaction control, etc. prior to initiating the actual session. The exercises may involve only one session of 15-20 minutes or may involve a sequence of sessions demanding a multi-session strategy plan.

4) The negotiating sessions of 15-20 minutes are then conducted and video-taped.
5) Small discussion groups of 6-8 participants gather/view and critique their individual performances and those of the other members of the small discussion group.
6) Operationally, in the small discussion group, each member of the negotiating dyad, the buyer and the seller, report their objectives and planned negotiating tactics at the outset. The video tape is then viewed. The group critiques the objectives of each negotiator and evaluates how each negotiator performed.

In the final segment of the course, each student is asked to prepare a summary evaluation of his own negotiating skills based on a specially prepared questionnaire which includes an inventory of negotiating skill items. Based on this personal evaluation, the student is asked to conceptualize a series of Negotiating Skill Improvement Projects that he can personally implement independently after conclusion of the course.

EDUCATIONAL TECHNOLOGY APPLIED TO AN ELECTRICAL ENGINEERING LABORATORY PROGRAM

Dr. John C. Lindenlaub
Professor of Electrical Engineering

Introduction

In the fall of 1969 a systematic reorganization of the EE laboratory program was begun at Purdue University. A global planning strategy which examined the program as a whole (rather than looking at individual courses) allowed us to make effective use of models drawn from the field of educational technology. The educational methodologies used in designing this program and the end product of this effort are described below.

The Educational Model

The reorganization was approached using an educational model which recognized the needs for clear statements of instructional objectives, mechanisms for information transfer, opportunities for students to practice and apply new skills, the importance of the personal dimension of education and evaluation procedures. Bloom's taxonomy (1) of educational objectives, which in a sense is orthogonal to the other components of the model, was used to plan a systematically increasing professional level of student laboratory activities. Because of the key role they play instructional objectives and Bloom's taxonomy will be described in more detail here. The remaining components of the educational model will be described within the context of the laboratory curriculum.

Instructional objectives: The development of the program revolves around the instructional objectives for each experiment and each course. Objectives were written so as to satisfy Mager's (2) criteria: (i) behavioral terms are used to describe what the student is to be able to do after the instructional period; (ii) the conditions under which he is to perform are specified; and (iii) a criteria of acceptable performance is stated. As an example:

> Given standard laboratory instruments you should be able to measure and plot the volt-ampere characteristics of a regulated DC power supply without damage to the supply or laboratory instruments. Your results should be within 5% of that obtained by an experienced electrical engineer.

The most important of Mager's criteria is that the objective be stated in behavioral terms his thesis being that you will never know if you've achieved your educational goals if you cannot observe whether or not your student has met your objectives. This concept of instructional objectives is analogous to placing engineering specifications on an apparatus design.

Taxonomy of educational objectives: Bloom categorizes cognitive domain objectives into six levels. Tabulated below is a brief description of each category of Bloom's taxonomy and our goal for the relative amount of student effort spent at the various levels of intellectual activity. By equating relative professional level with the taxonomy levels one can see that the goal of the laboratory curriculum is to develop students to the point where their laboratory work is carried out at a high professional level.

	Percent of Effort		
Taxonomy Category	Soph. Yr.	Jr. Yr.	Sr. Yr.
1. knowledge - facts, basic methods	20	5	5
2. comprehension - can use basic ideas	30	15	10
3. application - problem solving	25	30	15
4. analysis - penetrate structure of a problem	15	25	35
5. synthesis - carrying out a project	5	15	20
6. evaluation - judgment of a project or experiment	5	10	15

The Laboratory Curriculum

An overview of the program developed by applying the educational model is shown in Table 1. The EE curriculum requires at least 7 credit hours of laboratory instruction. Most students take EE207 and 208 as these courses emphasize basic skills, instruments and electronic components. Students generally choose one or two 300 level courses (depending on their career objectives) to take in their junior year. The 400 level courses shown are a sample of the fourteen courses beyond the junior year which offer laboratory experience to the qualified undergraduate. Examination of the table reveals that in early courses emphasis is on learning fundamental skills with a greater emphasis on analysis and sythesis activities as the student progresses through the courses.

The last column in Table 1 lists special features - a brief description of the ways we have implemented the components of the instructional model. Audio-tutorial techniques (3) are used in several courses as the primary mechanism for information transfer. The technique is particularly effective for instructing students in the operation of instruments (4). When motion plays an important part in the instructional process video tapes are used. A video tape of the procedure for fabricating an alloyed diode is used in EE407. Advantages of audio and video tapes over instructor demonstrations is that the instruction can be given to students individually in a timely manner and with the authority of the senior instructor in the course.

Audio-tutorial instruction and take home component kits have allowed us to provide more flexible opportunities for students to practice and apply their laboratory skills. Pre-recorded instruction has made open shop scheduling possible. Students may work in the laboratory anytime during the normal class hour day. Through the use of take home component kits time once spent in the laboratory wiring circuits may now be done by the student at home. The kits have been designed so they are cumulative in nature; by making a modest investment each semester senior students find they have accumulated enough components to undertake rather sophisticated design projects.

Several steps have been taken in recognition of the fact that the education process has an important personal dimension to it. As in many U.S. universities a large fraction of our laboratory instruction is carried out by graduate students. The professor in charge of the course meets with all students to clarify roles. An analogy is drawn between the academic "chain of command" and the organization of an engineering department. The graduate assistant is introduced as playing the role of first level management in the industrial organization whose job it is to assist students in meeting the instructional objectives of the course and to evaluate their work. A regular item on the agenda of course instructor meetings is a discussion of techniques that can be used to meet individual student needs. The simple step of providing students with the instructional objectives of the experiments has turned out to be an excellent mechanism for opening up two-way student-instructor discussions at the technical level.

Approximately 25-30% of EE306 and 308 is devoted to project work. Students may choose from a set of available projects or propose a project of their own. In EE495 a "cafeteria" of experiments is available and students choose a set which matches their career interests. Giving students the opportunity to design course content to meet personal goals is another method of recognizing the individuality of students.

Evaluation procedures include periodic examination of the student's notebook (informal reports), formal reports, oral exams and performance exams. Students are encouraged to revise and resubmit their formal write-ups without grade penality. This process parallels the industrial situation where a project supervisor will comment upon the first draft of a technical report and suggest ways of improving the document.

Two other evaluation methods are used in the laboratory program. A unique "earn a grade" system is employed in the digital design labs (5) and oral exams (6) are used in several other courses.

Summary

An educational model upon which an electrical engineering laboratory program has been developed has been presented and the resulting curriculum discussed. Key components of the model include instructional objectives at various levels of Bloom's taxonomy, mechanisms for information transfer, opportunities for laboratory practice and evaluation procedures. Application of the model has resulted in a planned progression to higher level objectives as the student progresses through the program, technology based information transfer mechanisms, additional opportunities for laboratory practice through open shop scheduling and the use of take home lab kits, and a spectrum of evaluation techniques.

Information regarding the availability of a slide-tape version of this material patterned after the oral conference presentation may be obtained by writing the author.

Acknowledgements

The laboratory program described in this paper would not have been possible without the help and cooperation of the authors collegues at Purdue University and the continuing inspiration provided by his students.

References

1. Bloom, B.S. (editor), Taxonomy of Educational Objectives, Handbook 1: Cognitive Domain, David McKay Co., Inc., N.Y., 1956.

2. Mager, R.F., Preparing Instructional Objectives, Fearon Publishers, Palo Alto, California, 1962.

3. Lindenlaub, J.C., "Applying Audio-Tutorial Techniques to Laboratory Instruction," IEEE Transaction on Education, Vol. E-12, No. 2, June 1969.

4. Lindenlaub, J.C. "Equipment Familiarization Through the Use of Audio-Tutorial Instruction," ASEE Annual Conference, Ames, Iowa, 1973.

5. Mowle, F.J., "The Evolution of a Digital Subsystem Laboratory," IEEE Transactions on Education, Vol. E-14, No. 3, August, 1971.

6. Lindenlaub, J.C. and Vass, R.W., "A Study of Scheduling and Examination Factors on Electrical Engineering Laboratory Instruction," IEEE Transactions on Education, Vol. E-14, No. 3, August, 1971.

ELECTRONIC MEASUREMENT TECHNIQUES COURSE TAUGHT USING AUDIO TUTORIAL INSTRUCTION

Dr. John C. Lindenlaub
Professor of Electrical Engineering

Electrical Engineering 207, Electronic Measurement Techniques laboratory is being taught using audio tutorial techniques. Under this instructional system audio tape recordings are used to provide the student with timely, authroitative instruction on instrument operation and experimental procedures. The course operates in the following manner:

Students are provided a set of notes which augment the audio instruction. Included in the notes are statements of the instructional objectives of the experiment, prerequisite statements, an estimate of the time required to do the experiment, a list of equipment required and visuals such as circuit diagrams and graphs to compliment the audio instruction. Upon entering the laboratory students check out a tape recorder and audio tape along with their other instruments and components. They begin their work by reading over the instructional objectives for the experiment. The tape then serves to guide the student's learning activities be it listening to the tape, working with instruments, wiring a circuit, reading an instrument specification sheet, performing calculations or recording data. By varying the instructional style of the recorded comments, students can be given detailed step by step instructions (as might be appropriate for a student's first experience with an instrument) or merely a brief description of the experimental objectives (as would be appropriate if the student were applying previously learned skills).

The use of audio tapes not only allows the senior instructor's comments to be given to each student, they can be given at timely points throughout the laboratory period. Audio tutorial also allows us to run the course on an "open shop" basis. Students are allowed to come to the laboratory anytime during the class-hour day any day of the week.

During the first class meeting students are assigned to a laboratory instructor who is responsible for evaluating the student's work throughout the course. Mechanisms for evaluation include informal laboratory reports, formal lab reports and small group oral exams. During the oral exam sessions three to five students gather around a table for 15 to 20 minutes. Questions based on the instructional objectives of the previous experiment are directed in turn to each student in the group. Students are allowed to refer to their notebooks when discussion curves, circuit diagrams, etc. After a student completes his answer, other members of the group are encouraged to make additions, corrections or add general comments to the discussion. In addition to providing evaluation information the oral exams provide an opportunity for closer student-instructor contact.

Instructors are always present in the laboratory room. By using audio tapes to provide repetitive instruction the instructors are freed to serve as consultants and to interact with students on individual difficulties.

Audio tutorial materials have been prepared for each of the courses 15 experiments. Additional information may be obtained from Professor John Lindenlaub, School of Electrical Engineering, Purdue University.

AN APPLICATION OF PERSONALIZED INSTRUCTION TO REMOTE SENSING TECHNOLOGY

Dr. John C. Lindenlaub
Professor of Electrical Engineering

Personalized instruction is gaining acceptance in many college disciplines as a way to effectively educate people of varied background and learning rates. It is also finding a place in the training of people not enrolled in programs of formal instruction. Reported here is an application of personalized instruction to data analysis, specifically remote sensing data analyzed through the facilities of a computer network accessing a unique software package.

In 1970, NASA approved and funded at Purdue University's Laboratory for Applications of Remote Sensing (LARS) the establishment of a computer network for diseminating the most recent advances in remote sensing technology to those people who would benefit from using them. As a part of this effort, there was a need to train potential network users in the basic theories behind the numerically-oriented analysis of remote sensing data, in the specific capabilities of the software they would be using, and in the procedures for using it.

The product designed to meet this educational challenge draws greatly on the audio-tutorial methods of personalized instruction and contains many of the features of Keller's Personalized System of Instruction. The package consists of a series of six mini-courses, each designed to take a student from an initial point, defined by the prerequisites of the mini-course, to an end point defined by its instructional objectives.

The student progresses in a linear manner through all six mini-courses, each of which provides a mechanism for information transfer, an opportunity for the student to practice or study the skills or ideas presented, and a problem or test situation where he can determine whether he has met the instructional objectives.

A wide variety of media is employed in the educational package, the selection dependent on the nature of the material and the objectives of the unit. Unit 1, the Basic Preparation, follows the format of a programmed text. The specific purpose of this unit is to provide a common background to students who expect to make use of the LARSYS data analysis software system, to acquaint them with basic concepts and introduce them to terminology used later on.

The second module is designed to give the student a quick, one-hour overview of the software capabilities of LARSYS, and the medium used is an audio tape supported by illustrations which are available either as slides or in a flip-chart/notebook format.

The next two mini-courses are designed to acquaint the student with the data processing hardware available to him at the remote site where he is working, and to this end the remote terminal is the "medium" used. The "hands-on" experience, which is the core of Unit 4, gives the learner a chance to use the terminal alone himself. Listening to an audio cassette tape through ear phones, he does as the tape directs him, obtaining the list of instructional objectives by using the card reader and continuing this self-guided work for an average of three hours. The audio tape is supported by a detailed set of written notes for the student to use and keep for future reference.

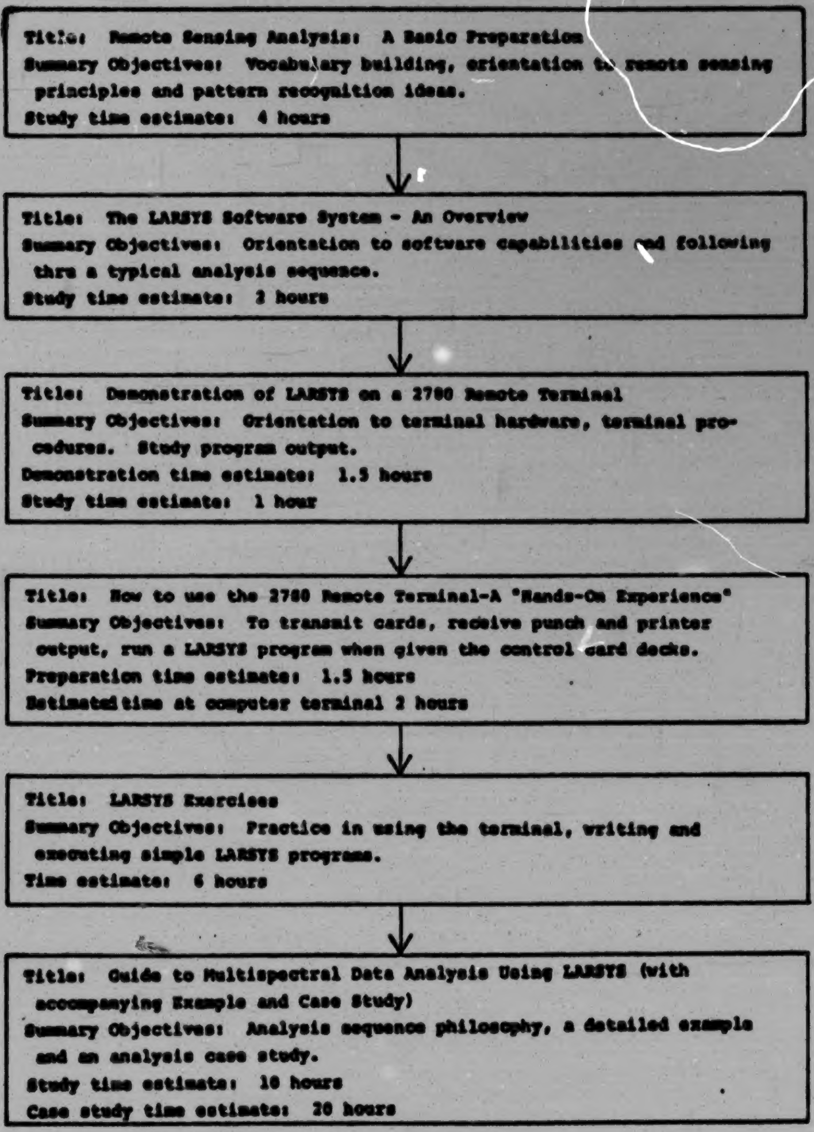
In the last two units of the Educational Package, the student, now familiar with the underlying concepts of remote sensing and with the operation of the remote terminal, can acquaint himself further with the LARSYS processing functions and proceed to study the analysis method in detail. Unit 5 contains six short exercises done at the terminal, and Unit 6, Guide to Multispectral Scanner Data Analysis, is a detailed investigation of the analysis process. Students achieve mastery of each step through a carefully developed sequence of study and activity; exercises and a case study analysis allow students to apply the theory and method he has just studied.

Though the student is to a large extent self-guided as he works through the modules, the success of his experience depends on his interaction with an instructor-consultant who is readily available to him. The function of the instructor is not to plan and preside over formal classroom sessions but rather to serve as a tutor helping to clarify troublesome points for the student.

The present version of the LARSYS Educational Package which has been in use since October, 1973, has elicited very positive comments from both students and their instructors, as well as from people such as project coordinators and techniques specialists who are more concerned with the mastery the student achieves then with the quality of his educational experience. Students have praised especially the logic and clarity of the materials and the step-by-step method used to explain complicated procedures. Instructors commenting on student attitude have further attested to the sense of accomplishment most students feel upon completing the materials.

In the years ahead advances in remote sensing technology will necessitate periodic revisions of the materials. The modular design of the materials is a major factor in easing the problems associated with these revisions.

The LARSYS Educational Package



Title: Remote Sensing Analysis: A Basic Preparation
Summary Objectives: Vocabulary building, orientation to remote sensing principles and pattern recognition ideas.
Study time estimate: 4 hours

Title: The LARSYS Software System - An Overview
Summary Objectives: Orientation to software capabilities and following thru a typical analysis sequence.
Study time estimate: 3 hours

Title: Demonstration of LARSYS on a 2780 Remote Terminal
Summary Objectives: Orientation to terminal hardware, terminal procedures. Study program output.
Demonstration time estimate: 1.5 hours
Study time estimate: 1 hour

Title: How to use the 2780 Remote Terminal-A "Hands-On Experience"
Summary Objectives: To transmit cards, receive punch and printer output, run a LARSYS program when given the control card decks.
Preparation time estimate: 1.5 hours
Estimated time at computer terminal 2 hours

Title: LARSYS Exercises
Summary Objectives: Practice in using the terminal, writing and executing simple LARSYS programs.
Time estimate: 6 hours

Title: Guide to Multispectral Data Analysis Using LARSYS (with accompanying Example and Case Study)
Summary Objectives: Analysis sequence philosophy, a detailed example and an analysis case study.
Study time estimate: 10 hours
Case study time estimate: 20 hours

A flow chart of the LARSYS Educational Package giving the title, summary objectives and time requirement estimate for each unit.

THE UTILIZATION OF VTR TO TEST MOTION PICTURES

Karl Lohmann, Jr.
Assistant Professor of Communication

A basic course in motion picture film production was started in the Department of Communication in 1968. The course is basically oriented toward the radio-TV majors, but it is also adaptable to the individual needs of students with interests in other areas such as agriculture, education, engineering, and industrial management.

The class is designed to give students the basic theories and techniques of motion picture production. Assignments are given in filming, scripting, editing, budgeting, production planning, and sound. Viewing and evaluation of films are used to illustrate a variety of film techniques.

By including sound in an introductory film production course, we departed from the content of the "standard" film production courses across the country. Universities with a complete "film major" program usually offer individual courses in the film production specialties. Film major students are required to take courses in still photography, followed by silent motion-picture production courses, followed by sound production and so on. Most schools with just one production course are offering experiences in only silent film production.

Producing a motion picture with a sound track is differet than making a silent film. The sound track adds a valuable new dimension to films. It also requires new considerations of how to go about filming. It takes a special kind of filming, writing, timing, pacing, editing, and coordination to put together a good film with narration, music and sound effects. Also, there are legal lessons to be learned about music and voices that can be used on a film sound track. We find that beginning students benefit from the opportunity to produce a sound film.

Students in the film production course write original film scripts, shoot their own footage, and edit their own film. They narrate or have other students narrate the sound tracks to accompany their edited films. Each student in the course spends at

$50 for film and materials. Actually recording a sound track on the film can be an unreasonable additional expense. At this point we encountered a need for an inexpensive methods for students to test their scripts by reading the narration and inserting sound effects or music while watching the film.

Since the Department owned no equipment and since there were no capital funds available, it was necessary to borrow equipment from the Audio-Visual Center and the Audio-Visual Production Department. Through experimentation it was discovered that several low-cost "non-professional" ½-inch video tape recorders with "high persistence" vidicon tubes could be used to record motion picture film with a minimum of picture "flicker" and without apparent "shutter bars."

I was surprised at this since I had tried the same experiment with "professional" broadcast quality TV cameras while working for the University of Michigan Television Office in the late 1950's. The results of these experiments were unpleasant "shutter bars" that would appear in the picture image. Expensive film chains were necessary to solve this problem.

The technique used in the film production class involves no film chain. A 16mm, 8mm, or Super 8mm motion picture projector is used to project the film on a white screen. Any of the normal projector speeds can be used. The VTR camera is set up besides the projector. Adjustments are made to make the screen image fill the viewfinder image of the VTR camera.

The student narrator should be isolated from the noice of the running projector in some way. He may be in another room away from the projector, or he may be in the same room at an adequated distance from the projector. The narrator is placed in a location where he can see the screen or the remote monitor of the image the camera is recording. The projector and the VTR are turned on, and the student narrator records his sound track while viewing the picture on the screen or monitor.

After the video tape is rewound, the recording can be immediately viewed and evaluated by the student, the teacher, and other members of the class. A different sound track or picture can be recorded subsequently and compared with the first. In addition, problems of telecast film cropping, picture detail loss, and contrast changes that occur in professional telecasting are apparent on the "nonprofessional" tape playback. Although I have used only black and white TV in the classroom situation, I did test one color VTR unit and believe it could be used to satisfaction in a number of situations.

Regular film chains should give a superior result to this makeshift arrangement, but in the absence of expensive equipment this inexpensive technique may be satisfactory for a number of purposes. To avoid legal problems this technique should be used only with films made by participants. It should not be used illegally to record copyrighted films. The technique could be used in a variety of ways. For example, slides and film segments could be recorded with narration on video tape and mixed with "live" faculty or students for a multimedia presentation.

The students who have used this technique found it helpful in learning to think about the relationship between picture and sound in films. One of them quipped, "I came out of it with a 'sound' mind!"

VOCATIONAL DEVELOPMENT SEMINAR

Dr. John E. Lovell
Assistant Professor of
Administrative Sciences

Effective with the fall semester, 1973, a developmental seminar has been offered to:

1. aid in the transition from high school to college;
2. help the student form meaningful relationships;
3. help the student to make decisions concerning courses of study and career choices;
4. to test skills in a new environment.

Individual Group Size: 10

Meeting Time: 1½ hours a week - 1 credit

Course Outline:

Session 1. Introduction: Explanation of the group format, procedures, and assignments. Goal of course: Answer existential questions of "Who am I, Where am I going, and How am I going to get there?" Discussion topic: My first day on campus to clarify individual expectations. Use Peter-Paul facilitation exercise. Also use internally developed "Life Goals Inventory."

Session 2. How I See Myself, How Others See Me: Students share initial impressions of each other. Goal: clarification of self concept "The Most and Least of Me" - Students discuss their strengths and weaknesses. Use Vocational Preference Inventory.

Session 3. Administration of Strong Vocational Interest Blank, Allport-Vernon-Lindzey Study of Values and the Edwards

Personal Preference Schedules Use Super's Work Values Inventory.

Session 4.	Group Interpretation of SVIB, EPPS, and A-V. Discussion "What this information means to me." How students plan to use their test profiles in vocational planning.
Sessions 5 and 6	Achievement: Discussion of achievement expectations and frustrations. Use of Leadership Process Questionnaire to facilitate discussion of achievement orientation.
Sessions 7 and 8	"I as a Learner." Administration and interpretation of the Survey of Study Habits and Attitudes. Discussion of how effective study habits are developed and meaning of self-discipline.
Sessions 9 and 10	"Me and my Morals." Discussion of value conflicts in the areas of sex, drugs, and religion. Goal: Identify and clarify values, experience ambivalence.
Sessions 11 and 12	"I am not an island." Use Pfeiffer and Jones' exercises to demonstrate group dynamics and sensitivity of a group. Goal: Students internalize the difference between individual and group behavior and glean a basic understanding of what separates effective fro ineffective groups.
Session 13.	"Inspiration." Students share personal experiences that had an influence on them. Goal: Clarification of what makes a person a person.
Session 14.	"What this did or did not do for me." Evaluation of the 13 meetings from both a personal and global point of view. A questionnaire will be administered to

provide some comparability of responses.

Sessions 15 and 16 Individual conferences with group leaders to discuss where the student is at as a person.

Two of the group leaders are doctoral students or advanced master's students in Administrative Sciences. Two training sessions before the first group meeting are held for the leaders.

1. The thrust of the first training session is communication skills and the interpersonal present;
2. The second training session discusses test interpretations using the aforementioned instruments.

In addition to the two training sessions, the group leaders meet once weekly with the course facilitators to discuss that week's session.

CONFLUENT EDUCATION MODEL FOR COLLEGE INSTRUCTION

Dr. Phyllis Kinnison Lowe
Professor of Home Economics Education

The confluent education model for college instruction is the result of some ten years of experience and experimentation at Purdue University in the Home Economics Section of the Department of Education. It is based on the premise that since education is a continuing process and college courses are often planned to build on one another, restrictions imposed by arbitrary course boundaries can be removed at least in part even in traditional schedules. To put it differently, there can and should be confluence (the coming together) of related college courses within the same level (e.g., undergraduate) and between levels (graduate and undergraduate). Therefore, the confluent education model in home economics education at Purdue University embodies seven courses, Ed. 304H, Ed. 450, Ed. 451, Ed. 454, Ed. 590, Ed. 656, and Ed. 695, four of which are at the undergraduate level and three which are graduate courses. All seven courses focus on a common ultimate product - the high school pupil to be taught in the public schools - and on a common intermediary product - the teacher of these pupils. Consequently, the encompassing strategy for the model is a spiral one beginning with context followed by input, process, product, feedback, and back to context again. Humanistic, diagnostic and performance based classroom techniques were developed and refined to incorporate affective as well as cognitive dimensions to the model.

Figure 1 below shows the course components of the model.

These should be discussed simultaneously since that is the way the model operates in reality, but to help the reader comprehend the parts, these components will be discussed separately and the figure can be used as a reference point to show their interrelationships.

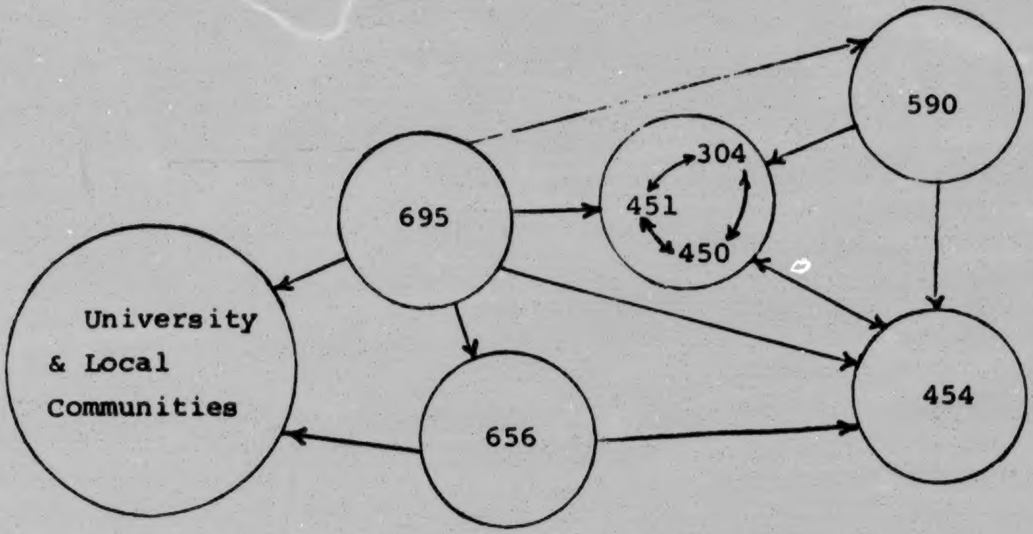


Figure 1. Confluent Education Model for Instruction

Ed. 304H, 450, and 451 are team planned as methods, principles, and organization of teaching respectively provide for contextual sequence. They are horizontally team taught to utilize this sequence as the college students progress through the professional semester. Ed. 304 utilizes practical experiences based on concerns and feelings rather than exclusively cognitive goals. Critical teaching skills are taught, analyzed, practiced, and diagnosed via small clinic groups composed of peers and via micro-teaching episodes of at least three per student. Ed. 450 focuses on planning components, organization strategies, and evaluation techniques laced with individualized instructional packages all of which are essential to the Ed. 304 practical experiences. Ed. 451 provides an integrating function context-wise as it draws upon the other two courses in its emphasis on program planning, community outreach and legislation affecting the vocational home economics teacher. Together, all three courses flow into Ed. 454, supervised student teaching, and provide the vehicles for some of the observational activities for supervision interns enrolled in Ed. 656 and Ed. 695.

Ed. 454 is structured in three parts, the pre-student teaching experiences, off-campus student teaching, and post student teaching analysis and diagnosis. It is one point of confluence for all seven courses in the model. Like Ed. 304, 450, and 451 it has affective as well as cognitive objectives as it employs group-on-group observation and critiqueing with penetrating examinations of teaching performance skills as well as affective results. During the pre-student teaching phase, small groups of high school pupils are taught a short lesson by the prospective student teacher. These lessons are video taped by the college instructor and a supervision intern. The student teacher, college instructor, and intern then review the tape together, critique the performance, diagnose the strengths and liabilities and make plans for reteaching the lesson to a different group of high school pupils. Then the lesson is retaught, critiqued and diagnosed again by the same individuals. The prospective student teacher is assigned to a qualified supervising teacher in an off-campus high school for the student teaching phase. Again Ed. 454 serves the graduate student supervision intern as she accompanies the college supervisor on visits to the cooperating school and participates in all contacts with the student teachers to whom she is assigned during the student teaching period as well as the post student teaching analysis and diagnosis.

Ed. 590 refers to a summer program where prospective student teachers engage in an internship with a variety of educational programs for disadvantaged learners. This is planned to precede the professional semester when the other four undergraduate courses in the model are taught. Here the college student gains first hand experience in working directly with learners who are in special educational programs because they have been identified as disadvantaged learners. This could mean that these pupils have learning disabilities, physical disabilities, or have psychological problems or come from lower economics levels any one or combination of which could have produced learning problems in the regular classroom. This internship experience feeds into the succeeding courses in the model.

Ed. 656 and Ed. 695 are designed to provide graduate students with intern experiences in supervision at several educational levels and settings. Ed. 656 examines supervision from the college teacher education vantage point and from the high school supervising teacher level for the most part. As the undergraduate students are developing teaching expertise in their particular courses, it is clear that Ed. 454 is made to order for a supervision intern to progress through observation, participation and supervised supervision. As these interns are developing such expertise in supervision, the undergraduates gain additional help and individual attention from the graduate intern during all three phases of Ed. 454. Ed. 695 has a broader base as it aims toward internship experiences in curriculum and supervision at every educational level. A 695 internship spreads and flows into all of the other six courses in the model as well as supervision and curriculum experiences based at the university, state department of public instruction, public schools and local communities in general.

During a semester approximately seven college instructors, 20 graduate students, and 50 undergraduate students participate in activities provided through the confluent education model for instruction. From formal and informal efforts to evaluate the model, there is general consensus that instructors and students alike have positive feelings about it. All agree they work hard, but almost without exception, they add that the learning gained is well worth the effort. Data collected indicate some reduction in anxiety of student teachers during the student teaching phase, more positive self concepts than when they started, gains in cognitive learning, and more effectiveness in individualizing the teaching at the secondary level as well as at the college level. A great deal more data and carefully designed experimental research are needed to further perfect the model.

NEW LEARNING TECHNIQUES FOR THE RECOGNITION OF INSECT GROUPS

Dr. W. P. McCafferty
Assistant Professor of Entomology

With approximately one million world species to contend with, acquiring the ability to recognize the major and important groupings of insects and their associated biologies is more important than ever as part of the education and training of today's students of entomology and pest management. Thus, Entomology 507 (Introduction to Systematic Entomology) remains an important required course for all of Purdue's Entomology majors, along with being a desirable elective for many Agriculture and Non-Agriculture students.

Having been involved in teaching systematic entomology at three major universities in the U.S. including Purdue, and also being aware of the approach generally used in teaching this subject, I can state with confidence that new and more efficient instructional methods must be developed. This conclusion is based on the following observations: First, the identification of the majority of the groups of insects is difficult and dependent on taxonomic keys (a series of alternative attributes must be interpreted exactly and in sequence). Keys, even on the textbook level, are highly technical in terminology, often ambiguous, and are generally intended for specialists since they may lack clarification and adequate accompanying figures. It has become a cliche that 'keys are written by people who don't need them for people who can't use them.' Secondly, a vast amount of time expenditure is now required by the average student to gain only the minimum foundation of knowledge. And third, there is often a lack of immediate relevancy for the student and so lack of desired stimulation for learning.

I firmly believe that teaching efficiency, student comprehension and retention of subject matter, and relevancy can be increased immensely via the incorporation of certain new teaching techniques.

Although, several new methods are planned in order to renovate this course as a whole, one special laboratory innovation requires special funding in order to be developed. I propose to develop a visual aid program for the interpretive diagnosis of insect groups, usable by both the beginning and advanced student. Such a system will be based on 2 x 2 color transparencies which will serve as characterization descriptors and supplement simplified keys. Then the student must choose an alternative situation when learning to identify specimens, an indexed slide can be readily retrieved for reference. Individual students will have a slide reference collection and a portable, self-illuminated 6X viewer at his lab desk. Such slides would also be available for wall projection and class discussion.

This system is expected to reduce the time required for initial identification by at least two-thirds. Morphological and adjectival vocabulary are visually represented, and the entire process of identification becomes a more direct, purposeful experience, therefore increasing retention considerably. Ultimately when fully developed and tested this system could lead to the identification of any insect by means of simple visual acuity; and video tape-computer interfacing is not unrealistic.

The microfiche system (which is somewhat similar to the system proposed) being developed in certain medical schools (e.g. Ohio State University) in relation to tissue and organ identification has been extremely successful and has contributed significantly to the reduction of a four year medical program to a three year program.

The system I propose is much more complex in development than might be surmised. Match and correlation between a real biological specimen and an image of such (on a microscopic level especially) has been historically limited by color and depth of perception, two factors which are critical to insect identification. Line drawings and black and white photographs are often difficult to relate to the real specimen, and all photographs lack needed depth preception to some degree. I plan on using a technique which will provide the best of both color photography and drawing in the illustrative aid material. Thus the system is different and expected to be more proficient than any similar program in existence.

Color photography will be accomplished via an M-5 Wild dissecting microscope fitted with a monocular head, double iris diaphragm, special illuminators, camera attachment, and an adequate 35mm single reflect camera. Color photographs will be developed and enlarged on flat mat paper. These will be color retouched by a scientific illustrator to add three dimensionality, and realism, and to highlight the key subareas which the student must locate. These will then be arranged in comparison sequences and rephotographed as reference color transparencies.

The process is obviously a tedious one, but the end result is well worth the means. Because of the time involvement, the complete incorporation of the system will take several years. However, there will be a significant number of reference slides available by the 1974-75 school year if the program can be initiated soon. Initial target areas will include those most troublesome areas of existing keys that the students will be using.

The basic M-5 microscope is presently available to me and a scientific illustrator works under my direction. I will need to purchase, however, photographic equipment including camera and attachments, some illustrative materials, and index slide boxes and viewers for the students.

SOIL SCIENCE STUDY CENTER

Dr. W. W. McFee
Professor of Agronomy

Instruction in Soil Science is non-traditional in two major respects: handling large numbers of students in small discussion groups and replacement of conventional laboratory and one lecture with audio-tutorial instruction in a soil study center.

The study center has 24 booths equipped with tape players and slide projectors. There is a large amount (approximately 100 linear feet) of bench space used for display and/or exercises involving descriptive material or wet laboratory type materials. The tape lesson, accompanying slides, detailed learning objectives, lesson outlines and the complete array of display materials are changed each week. The bulk of the course's information is presented in the study center where the student can listen, look, and do in a room surrounded with relevant materials. We attempt to make the study center a pleasant, friendly place where help is always available, and frequently offered even before it is requested. Students spend as little or as much time in the center as they desire. It is open and manned by a competent professor or graduate instructor 44 hours each week.

Prior to each week's work one lecture-demonstration session is given where the new material is introduced or the previous week is concluded. Demonstrations suitable for large groups, pertinent movies and presentations, in addition to examinations and administrative announcements are made in these sessions.

Following completion of each week, students meet is scheduled, small-group discussions. These groups of 11 or less discuss the material with an instructor for 50 minutes and are given informal, oral questions. In these groups everyone is known by the instructor and each other after a few weeks such that questions and discussion flows freely. This provides rapid feed back on our effectiveness, reinforcement of the students new knowledge, and experience for the student verbalizing his ideas.

Our system is expensive in manpower, equipment, and enthusiasm. It takes a lot of each, but we feel it is effective in knowledge transmitted and in humanizing the teaching process. Each week a student normally spends one period in a small group (10-11), one period in a relatively large group (60) and approximately 2 hours in independent study which includes some one-to-one tutoring in the study center.

In addition to its function in serving approximately 290 Soil Science (Agry 255) students a semester the Study Center is a place to rest a few minutes between classes in this area for previous students and it provides one spot where students know they can find sympathetic and competent help for problems arising in other courses in soils or related areas.

PERSONNEL RELATIONS

Dr. Frederick McLimore
Assistant Professor of Management Education

Having spent some fifteen plus years of his career in management with a large multi-national company, the instructor of this course realized the need to "build bridges" between higher education and industry.

His mission upon returning to Purdue was to expose students and executives to each other in a classroom interfacing forum. The objective was to bring greater understanding about business into the classroom.

Each visiting executive is expected to have a copy of the textbook and discuss his business experience as it relates to topics assigned to the students. In each case, the students are supplied with the company's annual report beforehand so that they have a better overall understanding of the executive's discussion.

After the students hear the executive, there is a question and answer session. Then the students rate the talk (both written and orally) on a leadership grid. Copies of these critiques are given to the visiting executives so that they may see how they rated.

The course regularly attracts top officers of large companies that cover a broad range of industries.

Visiting lecturers for this year are included in the enclosed syllabus. Presently chief executives are being scheduled six to nine months in advance of the actual classroom presentations.

In addition, students work on Prisoner Rehabilitation Projects; the Female and Black in Management; Education of Corporate Executives; Dress Code, etc.

In summary, the course seeks to bring "living proof" into the classroom, which adds a new dimension to the student's education. The basic philosophy is to try to keep "tomorrow" within sight. That's where the student will be upon leaving the classroom.

NEW TEACHING MODE IN AERONAUTICAL ENGINEERING

Dr. Francis J. Marshall
Professor of Aeronautics and Astronautics

Recently a new mode of teaching third year aeronautical engineering students at Purdue University has been introduced that has met with success on many levels. Primarily the students enjoy it and it is serving their educational needs both in immediate and long range. And it has affected the curriculum planning activities of the school.

In essence, the course employing the new mode, integrates, in a rational way, the basic academic disciplines of aeronautical engineering with the objective of constructing an airplane to meet a particular need which process, sometimes called design, is interpreted as intrinsic to all engineering.

Now schools of engineering have always had courses in design, a fairly generic term, common ones using the handbook and experience approach and/or considering the component, as opposed to the system.

However it is only recently, with the advent of system and allied concepts, and more importantly, the advent of the computer that one could attempt to formulate the problem and the solution technique on a rational deterministic basis. In a sense, the existence of this idea, even without the existence of the necessary theory establishing it, has been the implicit argument for the teaching of engineering in a university. And it is noteworthy that undergraduates, individuals of ability with interest in engineering, have responded so readily.

The new mode of teaching evolved from a junior class in aeronautical engineering entitled "Applied Aerodynamics and Performance." The syllabus called for material in flight mechanics, aerodynamics, stability and control, and propulsion with some simple performance problem drawing upon the former to demonstrate the integration of the disciplines. Aerodynamics received the most attention in that the teaching of subsonic wing theory was relegated to the course.

However, it was found that the degree of integration possible, in the original syllabus, was minor due to the constraints of a one semester course and the tendency was toward a survey, with the exception of aerodynamics, of the various pieces of knowledge required for the design of an aircraft with some relatively isolated performance problems.

It was seen that the required element of integration could be attained in one semester if the computer were employed. With this idea, there rapidly followed ways to incorporate system concepts, optimization concepts, numerical techniques, finite element or influence coefficient techniques in aerodynamics and structures, and ultimately the notions of computer-aided, integrated or total design.

The student, with a minimum background in programming but spurred by his interests in airplanes, was able to understand, and more importantly, to use these techniques.

The specifics of the course, conducted in an open-end mode, are:

1) A set of specifications (e.g. range and payload) for an aircraft and an index of performance (e.g. D.O.C.) are

given to the class.

2) Each student chooses a configuration (with volume constraint as given by the payload) in the context of a first step in an iteration process.

3) Lectures are given on flight mechanics (cruise, climb, and take-off), aerodynamics (force and moment data with experiments as the source), stability and control (longitudinal static stability), propulsion (a "rubber-band" engine with jet thrust, engine weight, altitude, and specific fuel consumption correllated), weights (correlation of dry weights and payload), structures (cantilever wing) and air transportation (D.O.C. based upon fuel consumption). Each area is defined as a distinct body of knowledge as manifested in an academic discipline and/or a department in an aircraft company.

4) A mathematical model, the set of equations with one or two free (or control or design) parameters and an index of performance to be optimized, is given to the class.

5) Simple techniques for optimizing (e.g. direct search), for solving implicit equations, etc. for use with a computer are given.

6) The student then creates his own program to optimize over the set of free parameters, given his own configuration as the first guess. He runs the program (with the very available help of a graduate assistant) to arrive as the first complete configuration, performance and optimum index of performance.

7) While the student is programming and running, more material is given on the input modules, primarily aerodynamics.

8) The student then evaluates the results of the first run. Having performed all the steps, he is able to view the process as a whole. On the basis of this, he is then encouraged to note the faults and to develop the program with respect to increasing the accuracy of the inputs (e.g. dropping simplifying assumptions), increasing the number of free parameters (which necessitates revising his original configuration), improving the accuracy of solution techniques, etc.

At this point in the course, not surprisingly, the student (who has chosen aeronautical engineering primarily on the basis of his interest in airplanes) is able to proceed on his own at a very fast pace.

The final exam consists of a final design report and an individual oral examination on the report. The grade is based, not upon the technological efficiency of the final design, but on the depth of understanding of the inputs and the process. One piece of evidence for this understanding is the presence of a novel element (e.g. an atypical configuration).

The prime result of such a course for the student is that he has a good time. The material has met his interests. He is able to work, relatively unhampered by the constraints of spot-check homework problems and quizzes, in a creative atmosphere such that he can utilize his own individual talents within the overall engineering structure. Also he now sees the need for taking further courses in aerodynamics, structures, propulsion, etc. and is able to perform better in these courses. And he is being exposed to a working mode, involving the computer, which will undoubtedly grow with time both in universities and industries.

The existence of such a course has affected curriculum planning activities. It is now intended to offer this in the sophomore year with all members of the staff involved in the teaching. This will allow for specialists in one discipline to better understand other disciplines in the context of engineering objectives and engineering education. In addition to allowing for better communication, discussions as to what is fundamental or core material for a four year curriculum in aeronautical engineering are facilitated.

It is believed that the introduction of this mode of teaching will result in a more efficient and healthy four-year curriculum designed for the student.

SELF-PACED INSTRUCTION IN
EE 440 - TRANSMISSION OF INFORMATION

Dr. O. R. Mitchell
Assistant Professor, Electrical Engineering

Dr. J. C. Lindenlaub
Professor, Electrical Engineering

This is a 4-credit hour, senior elective course for Electrical Engineers which includes about three hours a week of laboratory work. Each student is given an option at the first class meeting of taking the course on a standard lecture-discussion format or taking a self-study version of the course.

In the self-study section, the course material is divided into a number of units, each with a short test. The student works through the units on his own or with the guidance of a proctor or student tutor. The grade is based upon the number of units he successfully completes plus a special assignment of his own choosing.

The laboratory portion of the course in identical under either the lecture or the self-study option. It is run on an open shop basis allowing the students to work when and as long as they wish. Formal written reports are not required, but the student is normally given an oral exam on each experiment.

Details of Self-Study Option

1. Course Bulletin Board - All announcements concerning the course are posted on this board. Students are responsible for checking this boards at least every 48 hours.
2. Tutor Sessions - Regular hours are scheduled when students can receive tutoring help or take unit tests. The tutoring center is in the same room as the laboratory.

3. Biweekly Progress Reports - Students are required to make a brief oral progress report on their study activities at least once every two weeks.

4. Unit Materials - For each unit the student is given the following materials:

   a. Instructional Objectives - A list of specific things the student should be able to do upon completing the unit.

   b. Study Guide - Reading assignments in the text, thought questions, and short problems to guide study of the unit.

   c. Problems - A few longer problems that will help understanding of the material. Problems are not collected but a file of solutions is kept so that students can check their work.

   d. References - Corresponding sections of other texts which are on reserve in the library.

   e. Sample Test - Allows students to see depth of testing level and to check their grasp of the unit.

5. Unit Tests - To pass a unit test the student must not make any conceptual errors. There is no penalty for repeating a unit test, even several times. Many versions of each unit test exist for this reason. To establish eligibility for taking a unit test, the student must design and turn in a set of problems and their solutions designed to demonstrate his mastery of each instructional objective of the unit. Tests are graded immediately after taking and the student is directed to do additional work on the unit or to proceed to the next unit. There are no other required exams besides the unit tests.

6. Grades - The final grade is based on the number of units passed, whether or not a bonus assignment is done, and the quality of the laboratory work. The bonus assignment can raise the grade by one letter if it is of the caliber of the new grade. It can involve such things as a lab project, a term paper, development of a study unit, development of a lecture-demonstration, doing student tutoring or taking a final exam over the study unit material.

Details of Laboratory Operation

The lab is identical for self-study and lecture groups. It is run on an open lab basis in that students can work when and as long as they please. Instructors need not be present when students are doing their labs, but they are present at scheduled times during the week so that students can work at times when an instructor is present is they choose.

Each student is assigned to one of the lab instructors. Usually the student is given a 15-minute oral exam on each experiment which determines his lab grade. Most laboratory experiments have a detailed write-up, equipment lists, and an audio cassette tape which lead the student through the experiment. Later experiments are more open-ended and allow the student to work on problems using his own insight solution.

AN EXCELLENT MIXTURE FOR PSI: COMPUTER SCIENCE, PLATO, AND KNOWLEDGE LEVELS

Dr.Kenneth L. Modesitt
Assistant Professor of Mathematics
Fort Wayne Campus

A Personalized System of Instruction (PSI) and its variants have been utilized recently in many different areas of higher education. The advantages of this mode of instruction are numerous and significant, particularly to the student. He or she:

1. formulates or is given a set of performance objectives
2. is self-paced and self-tutored through the course with many available resources (peers, instructors, books, films, computers, ets.)
3. is evaluated by demonstrating mastery of the objectives at a pre-defined competence for each educational goal level. This mode of evaluation is in contrast to the normal mode of grading on relative class ranking. Perhaps one of the most notable attributes of the PSI is its fairness to the students: they know where they are going, how to get there, and how to know when they've arrived.

Many computer science courses are particularly amenable to PSI. The translation and synthesis level objectives are easy to define. Attaining by the student himself, i.e., did the program executive properly under the given constraints?

Moreover, computer science courses enjoy the advantage of being more likely to have resource materials which lend themselves to self-paced instruction. For example, computer-assisted instruction can be an integral part of a PSI course (9).

Experience has shown that PSI within a computer science framework is an especially valuable asset when compared to using PSI in other courses. Much of the computer science material is at the synthesis level in the cognitive domian. Whereas, at the early stages at least, other courses emphasize the application level, or at most some analysis. Bloom's taxonomy of educational goals (2,3) indicates that sythesis is a higher-order skill than the other two levels.

But this demand for acquiring a high-order skill in computer science courses is partially mitigated by the novelty of working with a computer. This tool is enhanced even more when encased in a standard conversational terminal or a PLATO student terminal.

The phenomenal popularity of computers of all shapes and sizes is well-known in many (most?) areas of endeavor, from art to zoology. Thus it comes as no surprise that computers are widely used in education.

Computers have been used more or less efficiently while operating in a batch mode by millions of students over the years. The batch mode of operation is akin to writing down instructions for a passive and not very bright assistant in, say, a physics lab. Then one tells the assistant to go perform the experiment indicated. The assistant returns--anytime from 30 minutes to a day later--only to say you misspelled a word in your list of instructions. The frustrations of batch mode computer operation becomes evident with this analogy. This is particularly true when the frustrations are encountered often, as they will be by students.

How much more sensible to watch the experiment being performed when you have immediate control over the procedure! A time-shared (simultaneous, independent execution of programs by multiple users) or mini-comouter system offers this flexibility. The former alternative is often preferred as the variety of possible experiments is much greater--the computer is larger, faster, more cost-effective, and offers more resources. Now the user can:prepare an experiment (procedure) a little at a time, have obvious form and spelling errors pointed out immediately, direct the computer to execute the)partial) procedure, be immediately informed of the results, and if incorrect, go back to modify the procedure. If the results are correct, then the procedure construction process is repeated for a new section of the problem. And all of this activity can occur while the person is seated at the time-shared computer relationship.

So the computer as a tool for education is well established. But more importantly for PSI, the wide-spread appearance on the market of time-shared and mini-computer systems has given the student a new and very significant flexibility. She can work when she is motivated and the instantaneous response is an excellent reimforcement. Several students enjoy utilizing the machine during the "graveyard" shift from mid-night to 8:00 a.m.--even peer tutors would be hard pressed to be responsive at those hours! Time-shared computer systems are excellent self-pacing tools for students involved in constructing procedures.

But what about a far larger class of people? Not all students will be involved in procedure construction. Do computers have anything to offer them? Again, the answer is affirmative. Computers (utilized in a batch mode) have been popular for many years in courses where large amounts of calculation and/or data are involved. In these areas, e.g., social sciences, numberical mathematics, business, and medicine, students have relied on and continue to relied on and continue to reply on programs which perform specified manipulations. However, these programs, so-called "canned" or library programs, were not written by the student. So computers are indeed of use to the non-programming student. Educators can readily ascertain the availability of library programs for their field. Batch-executed student runs can then form a flexible integral part of a PSI course, as computer centers are usually open most hours of the day and night.

Is there an equivalent of the programmer-oriented, multi-purpose, rapid response, many user computer system for the non-programmer type of student? Yes, very definitely. This problem is addressed by people interested in computer-aided-instruction (CAI)(7), computer-managed-instruction (6), computer-managed learning systems (5), and other. One of the most promising such efforts is a project of the Computer-based Education Research Laboratory at the University of Illinois under the direction of Don Pitzer. PLATO-Programmed Logic for

for Automatic Teaching Operation-is an interactive time-shared computer system to which are currently attached 500 terminals, and which expects to handle 1000 terminals by 1975 (1,8).

The memory component of PLATO currently holds about 3000 "lessons" in 80 or so different subject areas (see Appendix A). The lessons vary widely in style, reflecting the ability of their authors (students, as well as faculty) to incorporate many different types of knowledge and pedagogy. Some lessons are text-based and little more than expensive programmed-instruction manuals. The better lessons actively involve the student: make a diagnosis, construct a figure, translate a sentence, steer a car, make a game move, carry out an experiment, point to the proper bone. The lessons can be as simple or complex, as long or short, as the author wishes. Text and graphics (static and dynamic) display features and a keyboard are part of all terminals. Options for touch panels, microfiche displays, and audio output are also available.

The potential for PLATO in a PSI environment is considerable. PLATO lessons are resources which are readily available whenever a student wishes. If desired, the instructor can keep track of a student's progress with PLATO. The instructor can compose her own lesson (if the ones available are not sufficient or satisfactory) at the very same terminal on which her students take lessons. This device also is a remarkable motivator. The natural curiosity of the student can be well utilized with PLATO. PLATO could conceivably go a long way toward solving the problem of motivation which apparently plagues PSI (4).

A SEMI-SELF PACED COURSE IN PLANT LAYOUT AND FACILITIES DESIGN

Dr. Colin L. Moodie
Professor of Industrial Engineering

Introduction

The purpose of this course is (and has always been) to acquaint Industrial Engineering students with the currently used design techniques and methodology for industrial manufacturing systems design as they relate to production and associated facilities location and controlled movement of production materials. While the main thrust of the course lies within the realm of industrial manufacturing, analogies are given, where possible, to non-manufacturing systems, as in hospitals.

Traditionally this course has had a lecture orientation with a laboratory period during which students worked on a plant layout design project. An attempt was made to have the lectures coincide with design project progress but this was not always successful. The course has been changed so that it is now completely built around the design project.

The course has been divided into five segments, called modules, which are presented in a semi, self-paced format. Lecture periods are used only rarely and then only for written tests or enrichment lectures. The design project has been designed so the course educational objectives are realized by doing the projects.

Course Structure

The goal sought is for the students to learn about plant layout and materials handling as they work on their project. Each module is a nearly self contained instructional unit which guides the student through selected readings and project assignments. Each module has a time limit which may be exceeded only with a severe grade reduction penalty; however, early completion is encouraged so that work on the next module may begin. An examination based on the contents of each module, is given when it is completed.

The project group (usually 4 students) is the basic learning unit in IE 484. The group works on the project together and this tends to aid individual learning of the material. All members of a group are responsible for knowing about all facets of their project. The test given at the time of module completion (part oral, part written) assumes this. The group makes the oral presentation together, with the instructor and the T.A. as listeners. As previously mentioned, completion of modules prior to their due date is possible, and even encouraged. It is possible to complete the course several weeks before the official end of the semester; however, last semester's experience indicated that most students were not inclined to do this.

The five modules and their time limits are as follows:

Module #1	Product Analysis for Plant Layout	3 weeks
Module #2	Preliminary Layout Design	3 weeks
Module #3	Layout of Non-processing Areas	3 weeks
Module #4	Finalizing the Layout	3 weeks
Module #5	Presenting the Layout & Cost Analysis	2 weeks

Except for the first three lectures, the lecture period is used only occasionally. At these special times enrichment lectures are presented by qualified invited speakers who discuss certain aspects of plant layout and materials handling. The project groups are expected to meet their scheduled laboratory periods. Specific problems are ironed out at that time and the instructors will depend on student attendance so that general information on special lectures can be disseminated. The IE 484 staff is available to answer questions during their posted office hours, the unused lecture hour time, the scheduled lab periods, and other times by appointment. If a group has a question on a specific aspect of their project or certain concepts of plant layout determined from their readings, the entire group is encouraged to approach the instructor to learn the answer.

Some Teaching Aids Used

A series of computer programs is available for the students to analyze their data and aid in their design decision making. These programs allow a degree of student interaction and have a number of options so that the students are afforded some degrees of freedom in their designs.

The project work is graded at the end of each module and each project group is given the opportunity of correcting certain aspects of their work to improve their grade. The corrected material is given the same grade as it would have obtained if done properly the first time. The goal here is to afford the students the opportunity to make a mistake (a learning process) with no grade penalty.

Future Worked Planned for Course Improvement

It is planned to build up a library of cassettes tapes on various aspects of plant layout and facilities design which will highlight certain important, but sometimes difficult to understand (or appreciate), parts of the plant design. The tape cassette machine available allows the inclusion of visual (35 mm slides) as well as audio information.

SELF PACED COURSE IN ADVANCED PRODUCTION CONTROL

Dr. Colin L. Moodie
Professor of Industrial Engineering

Introduction

The educational objective of this course is to acquaint the student with modern quantitative, computer oriented models used to control discrete part production in a manufacturing environment. This course has been offered for over 15 years and has always been given in the lecture format. The course has now been converted to the self-paced, mastery format. It is felt by both students and instructor that an improvement has been made. The course student critiques have, in general, indicated that the students might have worked a little harder under the new system, but they enjoyed it, and they learned more.

Course Structure

The course material has been divided into eight integrated, heirarchical modules which facilitate self study. Each module has a given time limit, usually the equivalent of five or six lecture periods, during which it must be completed. If the student exceeds this limit grade penalties will be rendered. When the module has been completed the student brings it to the instructor or TA during the posted office hours, or at any other time by appointment. The problems to be worked out with each module are checked, and if completed properly, the student is given a written quiz covering the material of the module and specifically concerned with the educational objectives of the module (which are listed in the instructional material). The quiz requires 20-25 minutes. If passed satisfactorily the student is given the reading material and problems associated with the next module. The process of working on and completing modules and taking quizes is repeated until eight modules have been completed. It is possible, with extra effort on the student's part, to complete the course a number of weeks prior to the official end of the semester.

The eight modules and their time limits are as follows:

Module	Time	Lecture Period Equivalent
1	Forecasting the Production Quantity	6
2	Master Scheduling	3
3	Introduction to Requirements Planning	6
4	Dynamic Lot Quantities	6
5	Order Quantities for Batch Production	5
6	Scheduling & Sequencing Order Quantities Through Production Facilities	6
7	Production Control of Assembly Operations	6
8	Network Models for Resource Balancing	6

Some Teaching Aids Used

As previously indicated the lecture period has little use in the self-paced format of IE 579; however, lectures are available to the student through an extensive collection of cassette tapes which have been made for this course. The student can also get an individual lecture on a certain aspect of the course by merely coming to the instructors office. Before beginning a module the student can utilize a cassette, along with a written listening guide on which he can make notes as he listens, which introduces him to the material to be covered in the module and links it with material covered in preceding modules. There are also cassettes available which will help a student to better understand certain mathematical models which he will encounter as he works through a module. The goal of these tapes is to "nurse" a student through an example which utilizes the mathematical model. These cassettes are usually of the programmed stop type so that the audio will stop at certain points in the discussion so that the student can work on the problem. He can restart the audio by pushing the appropriate button on the tape machine.

A number of computer programs are available on the Purdue time share system to aid the student to solve large problems as well as to acquaint him with the types of computer software available to control industrial discrete part production. The student can write some software to solve some problems.

Future Work Planned for Course Improvement

Since the topical area of this course is so broad and since interests and backgrounds and objectives of students will differ it is planned to develop some additional course modules which can be taken in lieu of the others. It is planned to specify 5 or 6 modules as basic to the course and allow the student to select 2 or 3 modules from several others in order to complete the requirements of the course.

"MUSIC AND HISTORY"

Dr. Gordon Mork
Associate Professor of History

and

Mrs. Caryl Eckstein
Music Supervisor, Radio Station WBAA

WBAA produced and aired a fifteen week series of programs titled "Music and History" in the spring semester of 1973. The programs were designed and broadcast in conjunction with the course History 204. "Introduction to Western Civilization: The Modern World," taught by Gordon R. Mork, Associate Professor of History.

The impetus for the series was Professor Mork's desire to give his students a "general flavor of the times" by integrating slides of art and architecture and recordings of music with his lectures. As his class periods did not allow enough time for listening to records, he suggested the project to WBAA. Professor Mork and Mrs. Caryl Eckstein, WBAA music supervisor, worked together to produce a general survey of music, placed in its historical context.

Constitutions and speeches are historical documents, but so are symphonies and concerti. Each one-hour segment includes a brief historical commentary and several selections of music representative of the period then under study in the lecture and discussion parts of the course. For example, the first program includes a Gregorian Chant and music from the court of Henry VIII of England to provide another avenue of insight into medieval and Renaissance Europe. When we are studying the Napoleonic era, one entire program is devoted to Beethoven's Third Symphony. To parallel our discussions of the twentieth century, the program uses works by George G rshwin and Dimitri Shostakovich. Brief duplicated program notes are provided the students so that they have easy access to the spelling of the proper names and the titles of individual works.

Examinations in History 204 are based on both long and short essays. Students are given the option of choosing exam questions which do not deal with the musical program, yet many choose to answer questions on the program, discussing such matters as the structure of society revealed in Mozart's opera, The Marriage of Figaro.

In cooperation with the Measurement and Research Center, several surveys have been run on the student response to the program. During the Spring Term 1973, telephone and in-class surveys indicated that approximately one fourth of the class listened any given week. The significance of such data is not easy to access. Professor Derry, Measurement and Research, concluded that such a fraction would "seem higher than most experts would guess as an expected number of listeners". Two surveys during fall semester, 1973, indicated students were modestly positive when asked if the program was a "valuable supplement to the course". Based on this data, on responses on examinations, and on individual comments by students, we can conclude that a majority of students neglect to listen to the radio program when given the option to do so. A significant majority, however, respond favorably and even enthusiastically. If we believe what we say about "individualizing instruction", therefore, "Music and History" provides a valuable approach to one aspect of western civilization. In addition, it provides radio programming to the community quite consistent with the mission of public and educational radio.

The individual programs were designed to supplement weekly lecture material by Professor Mork and were broadcast in coordination with the class schedule. Each program was aired twice a week in the spring semester and taped copies of the programs were made available at the Audio-Visual Center. Additionally, the programs were self-contained, making them meaningful to the general listeners as well as students enrolled in History 204.

A survey of class members conducted by the Measurement and Research Center indicated 22-24% of the class were regular listeners, a high percentage for an optional assignment of this type. Letters and telephone calls from WBAA listeners also indicated an appreciation for the series.

On the basis of this success, the programs were revised for the fall semester and broadcast again on a twice weekly basis, with the new programs also made available through the Audio-Visual Center.

This series has been a valuable addition to WBAA's broadcast schedule, providing a contribution to both University instructional activity and public radio.

A CONTEXTUAL PERSONALIZED APPROACH TO THERMODYNAMICS

Dr. James G. Mullen
Associate Professor of Physics

A new approach was tried in teaching Physics 515 (Thermodynamics). The course was organized about a series of projects (5), which were designed to help students put their studies in a specific context and avoid the sense of fragmentation which some students have when working isolated homework problems.

Students were graded on the basis of their project reports and a final report summarizing each student's assessment of what he personally got from the course. Student participation was enhanced by presentations of specific aspects of each project, with students being given enough advanced notice to avoid embarrasement. Also, several demonstrations and visits to some of the physics research labs were done to enhance student motivation and try to give students a deeper sense of the relevance to their studies.

On one of the projects, I invited interested students to do some associated lab work and a paper was written on our studies which is to be published in the American Journal of Physics. The two students involved in this activity, the laboratory and research experience, was very valuable and they found the process of publishing a paper a memorable experience. One said in his final report, "The experience of the lab environment and aspects of publishing a paper is something I will not forget."

In general, the students gave very favorable impressions of the course in their final reports. Some sample comments follow:

Bob Brown:

"I think the project approach went a long way towards reducing feelings of fragmentation. The fact most of the aspects of each project tied these concepts together gave one a sense of accomplishment. In a way, it gives you a feeling of being able to duplicate in a small way what you should be able to do when there is no one around to tell you the answers."

Jerry Rankin:

"I think I will retain the ideas I learned in this course longer than I would have by simply working out various homework problems, in that I feel that each project was like an episode of life and that one surely remembers episodes longer and more vividly than scattered unrelated thoughts."

Mark Newlin:

"The course was, of course, more personal than the more conventional course. I enjoyed the learning more as I was freer to study what I thought interesting and was not as confined to a set deadline. I felt more relaxed in thermodynamics and have a much greater interest."

"The closer rapport with fellow students and professor was especially good. By semester's end, I felt that I knew them and had not just sat in a room with a group of strangers. I especially liked the increased interaction with the professor."

Paul Raglin:

"I believe I learned as much following this approach of teaching as I would have from the standard lecture method. Knowing there are no tests is a pleasant change, but I do not think that would effect my grade, performance, or attitude. Therefore, the advantage to this type of class for me was the atmosphere created in the classroom. Thermodynamics has been the first course I have taken at Purdue where I have become acquainted with the other students as well as the professor. Thus my desire to try to contribute to the class discussion or to at least be prepared to participate was greatly enhanced. I also believe this increased my interest in, and hence, my ease in learning and understanding the material covered.

THE COLOR TELEVISION SYSTEM AS A CASE STUDY LABORATORY

G. W. Neudeck
Associate Professor of Electrical Engineering

The "case study" technique has been effectively used in a number of disciplines such as law, medicine and engineering. In law and engineering these case studies have traditionally been "paper" studies of actual events, programs, or products. A case study laboratory and the use of a commercially available system are both nontraditional to electrical engineering.

The color television system incorporates almost all of the areas within electrical engineering in its design and operation. This is the main reason that it was chosen as a laboratory case study in engineering. Another reason is that it has unquestioned usage and importance in our society and is therefore relevant to each student. Additionally, it is a topic that electrical engineering students would like to understand more fully but we teach no courses dealing directly with television systems.

The purpose of the course was to illustrate by example "how and why" a sophisticated commercial electronic system works and how this is related to all their previous instruction. A secondary but important aspect was for them to be able to design certain parts within the system. The objective was to give students a working knowledge of the system and at the same time illustrate the theoretical and practical aspects of a given system. This was to be done with the system as a whole as well as with an in-depth study of some individual circuits.

A secondary objective was to have the student learn about the system by "doing." That is, by physically tracing the video signal through the system he would discover for himself how various parts of the set function and how they were constructed. It has been shown by several studies that experience based learning provides longer retention and depth of understanding.

To accomplish this interaction between the theory and a commercial system, a grant was obtained from a well-known manufacturer for 6, all solid state, color TV sets and sufficient money for equipment and supplies to initiate the laboratory. Due to the delicate and sophisticated nature of color TV and the many lethal voltages (up to 23,000 volts) it was decided to develop the course material first. At a later date it would be decided if any self-paced or audio tutorial instruction, etc., could be applied. Therefore, we were concerned with the course material and with the pedagogical techniques, not with the application of educational technology.

The first exercise is to obtain a working knowledge of color television from a system point of view, i.e., how each "box" processes the signal and how the boxes are tied together. The radio frequency tuner, oscillator-mixer, automatic frequency control and other circuits comprise the first set of boxes.

Since no experience in television can be assumed, an extensive set of pre-laboratory material must be read by the student. This material is mainly on the theory of television. A full understanding and appreciation for the theory depends upon the student recalling the concepts presented in other electrical engineering courses, i.e., reinforced learning. The TV set is turned to a channel and a good oscilloscope is used to view the demodulated composite waveform which includes the synchronization pulses and video waveform. The second set of boxes is the l-f amplifiers and the video detector. The student finds the "box" on the circuit diagram and then finds the part on the back of the TV set. With an oscilloscope, he can view the incoming and outgoing waveform to see what function each "box" has had on the signal. In each case he has probably studied the individual boxes in one or two different theory courses but not as a practical system. The signal is then traced from the input to the audio speaker through the various detectors and amplifiers; thereby a good example of r-f, l-F, low level, and power amplifiers. At the same time AM and FM detection are illustrated. The video amplifier is an excellent example of a broad band system amplifying the signal before being applied to the cathode ray tube.

The digital part of the system is traced from the synchronization pulses (horizontal, vertical, and equalization) of the composite waveform to the generation and formation of waveforms which drive the deflection system of the color picture tube. Saw-tooth generators and synchronization are illustrated. The color matrix and phase sensitive modulation scheme is particularly interesting and sophisticated. The theory of interlaced scanning and the frequency interleaving of the black and white with the color signal are good examples of system design, i.e., the "why" of the system.

This signal tracing also requires the student to learn how to use a good oscilloscope in a number of different modes, thereby reinforcing his previous laboratory experience.

Other experiments have been devised to consider each specific box of the system in more detail, i.e., the "how" each box functions. The topic is first presented in a general sense with several examples of typical designs. Then, the TV in question is examined and many questions are asked the student about this particular circuit. These questions can be answered theoretically or by making measurements with an oscilloscope.

Without going into all the detail associated with the experiments, we have been able to tie the theory of communication systems, electronic design, digital circuits, linear circuits, etc. into one commercial system. This enables the student to have specific and concrete examples of how most of his electrical engineering background can be used to solve engineering problems. It is a good mixture of theory and experiment in the case study of a particular system design.

AN INDUSTRIAL-ACADEMIC COURSE IN HIGH TEMPERATURE MATERIALS

Dr. John F. Radavich
Associate Professor of Materials Engineering

In the Fall of 1973 the high temperature materials course was offered to eleven students in the School of Materials Engineering. The emphasis of the laboratory effort was on the current problems of production and use of powdered high temperature materials. Various forms of these high temperature materials forms were obatained through the courtesy of Teledyne, Kelsey-Hayes Co., Wyman-Gordon Co., and General Electric Co.

Students were divided into small groups and each research project undertaken was related to each other and to the general better understanding of this new materials technology. The research projects were carried out using the most modern equipment such as scanning electron microscopes, X-ray chemical analyzers, and X-ray diffraction equipment.

The cost of film, solutions, and other necessary supplies was borne by mini grants of $400 each from Teledyne, Indland Steel, and Climax-Molybdenum Co.

On December 10, 1973 a Student-Industry seminar was held in the School of Materials Engineering and the students presented their findings. Thirty-six representatives from twenty-two companies were in attendance, and the areas involved ranged from Arizona to Massachusetts. The seminar was highly successful and the proceedings of the seminar are being compiled into a bound form for distribution to the attending companies and other interested parties.

Enclosed are letters of acceptance of such an instructional activity. It is hoped that that this type of activity can be a yearly event for Purdue and Industry.

Generally, an academic course presentation involves lectures dealing with the theory and a laboratory may be associated with the lecture material. In the case of some material courses where only simple systems are involved, the theory and material behavior can be adequately explained. However, when systems become complex as is the case of high temperature materials, frequently the theory of the material behavior does not agree with its engineering behavior. The engineering requirements and technology in the high temperature material area in industry is rapidly changing and often long lags are encountered before pertinent subject matter is available and taught in University classes.

The unique situation of being involved with industry in their development of high temperature materials and to have first hand experience in their behavior under different engineering applications affords an excellent opportunity to develop an academic course in this area which incorporates up-to-date theory, production practices, and end uses of such materials. Participation with industry in materials programs offers unusual opportunities to obtain the latest materials which can be used for academic laboratory projects. The results from such student projects are of great interest to industry.

By using current high temperature materials furnished by industry for student research, many unusual positive benefits are obtained:

1. The student becomes involved with the most current materials

and his research is thus original and valuable to industry.

2. The student is better able to evaluate the known theory to the actual behavior of the materials under different engineering conditions.

3. The student is asked to write a report which incorporates his research results to previous knowledge about his material. Such reports are then made available to industry.

4. Because the materials were furnished by industry, the results of the research are followed closely by industry -- thus greater interactions between industry and University are achieved.

5. The student effort is accepted on a professional level by industry which promotes confidence and professional standing within the student.

6. Quality student effort promotes confidence by industry in the department involved and has resulted in seed or min-funds which opens the door for greater involvement with industry.

7. The student projects offer opportunities for student publications in professional magazines and for oral presentations in University sponsored Student-Industry seminars to all interested industries.

Language Training for the Retarded: A Videotape Series

Dr. M. Irene Stephens
Audiology and Speech Sciences

Recent linguistic descriptions of developing language, as well as Piagetian research in cognitive development, and well-implemented behavior modification programs have given us newer ways of enhancing language skills in the retarded. This series of six videotapes shows the teacher/aide/volunteer a variety of ways of improving language in the retarded individual.

The first two videotapes explain some necessary linguistic terms and trace stages in the normal development of language. The remaining four treat individual and group procedures in detail. For instance, a question/answer conversion drill with the choral response from a sizeable group is shown. Two examples of "echoers" and how their responses were shaped toward appropriateness is displayed. A wide variety of institutions in Indiana are included, ranging from the choir of a multi-service big-city school in Gary to a small, young pre-school group at "First Chance" in Paoli.

The tapes have been utilized in a number of ways. Some Association for Retarded Children groups have shown 2 per day for a three-day inservice workshop. University faculty (e.g. Butler, Ball State, Indiana University) have chosen part or all of the series for a section on atypical language. The series was recently chosen to be included in the Multimedia Theatre at the National and international conventions of the Council for Exceptional Children.

Although the tapes can stand alone, there is a pamphlet of written materials which may accompany the tapes.

These tapes, then, exemplify how heterogeneous the retarded population is and what choice of techniques now exists for enhancing and modifying their language behaviors.

AN OPEN LABORATORY IN FLUID MECHANICS

Professor H. Doyle Thompson
School of Mechanical Engineering

I. CONCEPT AND DESCRIPTION

The "open laboratory" was initiated at the beginning of the Spring Semester, 1973, in the basic undergraduate Fluid Mechanics course (ME 310) in the School of Mechanical Engineering.

The basic objectives of the ME 310 laboratory are motivation and instruction. Since this is the first exposure for most students to the fundamentals of fluid mechanics, the motivational aspect is perhaps the most vital.

The concept of the open laboratory is extremely simple: Each experiment consists of a written outline and student notes. These materials are supplemented by both a set of 35mm slides which emphasize the basic fluid mechanics principles to be studied and illustrate the steps to be followed, and a tape cassette which describes the procedure. The student chooses his time to perform the laboratory experiment (within the one or two week time period that it is assigned). After completing the experiment, a second set of slides and taped explanation provides an immediate critique, and re-emphasis on the fundamental concepts demonstrated by the experiment.

To date thirteen different fluid mechanics experiments have been prepared for use in the open laboratory. Others are being developed and will be interchanged from semester to semester. The experiments in the current library are:

Exp. No.	Title
1.	Introduction to the Laboratory
2.	Flow Patterns
3.	Reynolds Experiment
4.	Rotating Flow
5.	Momentum Study: Force on an Elbow
6.	Velocity Measurements: Wind Tunnel Calibration
7.	Velocity Profile in an Air Pipe
8.	Momentum Study: Draining of a Tank
9.	Modeling and Dynamic Similarity*
10.	Pipe Friction*
11.	Boundary-Layer Study*
12.	Pressure Distribution on a Circular Cylinder*
13.	Compressible Flow*

*Two week experiments.

The instruction portion of each laboratory experiment consists of from 10 to 40 35mm slides (mostly color slides) and an audio taped set of instructions. The length of the instruction tapes varies from 8 to 20 minutes.

The critique portion of the experiment consists of a series of slides of an acceptable report showing the data, the calculations, graphs, charts, answers to specific questions posed as part of the instructions, and other relevant information. The critique slides are 4 to 18 in number and the taped discussion varies from 5 to 20 minutes.

Experience has shown that two copies of the instruction and critique materials are adequate for the 100 to 150 students in the class each semester. A third copy is kept as a spare.

II. RESOURCES

1) Faculty

The development time for the open laboratory has been Prof. Thompson's time (officially at 20% for two semesters) plus TA time (two ½ time TA's for two semesters).

Under the open laboratory arrangement the grading of lab reports and other administrative chores are easily handled by the lab instructor on duty, so that no time outside the lab is required. The actual faculty load for administration of the laboratory is probably very comparable to that under the previous, more conventional laboratory. The taped instructions and critiques have made the use of TA's practical for a large part of the report grading and laboratory instructor assistance.

The laboratory was actually open as indicated below:

Semester	Lab Open (hours/week)	Course Enrollment
Spring 1973	38	108
Fall 1973	49	157
Spring 1974	42	76

2) Funds

The direct cost of initiating the open lab has been primarily the audio-visual equipment and film processing. The consoles were found in the basement of the ME building (discarded from a previous unsuccessful attempt at a similar undertaking) and repainted. Slide projectors, tape recorders, carrousels, blank tapes and photographic processing and supplies have totaled about $2,500.00 to date. Additional funds have been spent to update and repair old equipment, make new experimental equipment, and for general laboratory improvements. These are expenses that would have been necessary under any system and are not peculiar to the open lab.

3) Equipment and Space

The laboratory equipment consists of:

two low speed wind tunnels
three Reynolds flow tanks
two water flow pipes

two air flow pipes
one smoke tunnel
one compressible flow vacuum pump, schlieren, etc.
two or three copies of special equipment for specific experiments

The open lab has resulted in a much more effective use of limited laboratory space and equipment, and makes it possible for each student to individually use each piece of laboratory equipment. In the past, experiments were performed in teams of three to five students because of equipment limitations. There has been no increase in the number of pieces of equipment required, the equipment is simply used more efficiently, and more intensively.

The laboratory space itself now serves a multipurpose of a laboratory, a study room, and to a small extent a computational center since four HP-35 calculators are made available for student use on a continuous basis in the open laboratory arrangement.

III. Evaluation

The open laboratory provides the following positive contributions to learning that were not being provided under the conventional laboratory arrangement.

1) Increased motivation.
2) Immediate feedback of reports in the form of the critique slides and audio tape.
3) The opportunity for each student to perform each experiment instead of having to work in teams of 3 to 5 students.
4) The opportunity for a motivated student to spend additional time making measurements or investigating related ideas.
5) The consistant instruction in correct principles of data collection, evaluation, and presentation.

To evaluate the effectiveness of the open laboratory a questionnaire was distributed at the end of both the Spring 1973 and Fall 1973 semesters. Except for one or two questions the questionnaires were identical, and the compiled results from the two semesters were very similar in every respect. A total of 140 students responded to the questionnaire of 265 enrolled. The responses were unsigned and voluntary. A composite summary of the response to the questions relating to motivation and learning is given below.

Questions and results relating to motivation.

Do you like doing each experiment at you convenience rather than meeting in a regularly established laboratory period each week?

100%
Yes 140/140 No 0/140

Do you like the open lab approach, with audio-visual instruction, better than the conventional laboratories you have experienced?

96%
Yes 134/140 No 6/140

Questions and results relating to increased learning.

Do you feel the open lab is an improvement from the educational point of view. That is, do you feel you learned more this semester 310 lab than you would have if the lab had been conducted on a "conventional" basis?

87%
Yes 122/140 No 18/140

Do you feel the laboratory experience helped you on the exams?

36%
Yes 50/140 No 90/140

Do you feel you learned more by performing each experiment on you own initiative rather than with a group of other students?

73%
Yes 102/140 No 38/140

Are the laboratory instruction tapes and slides explicit enough?

80%
Yes 112/140 No 28/140

Do you think the instructions specified too much, and that you should be left to figure out more on your own?

94%
Yes 8/140 No 132/140

Are the laboratory critique tapes and slides explicit enough?

92%
Yes 129/140 No 11/140

Do you feel the critique is valuable?

88%
Yes 123/140 No 17/140

IV. OTHER CONSIDERATIONS

To help explain procedures and results a fictitious character Floyd Fluids was created. Floyd has been through the course many times but still pulls an occasional boner.

As a side issue, a number of former ME 310 students have chosen fluid mechanics related projects with the express purpose of developing new and varied experiments for the open laboratory.

INTEGRATED CIRCUIT FABRICATION LABORATORY

Dr. Hannis W. Thompson
Professor of Electrical Engineering

The School of Electrical Engineering offers a 3-credit, one semester course in integrated circuit fabrication as a dual-level, graduate/undergraduate course. The students attend one hour of lecture per week and work in the laboratory under constant supervision for two, two-hour periods each week. The course stresses actual hands-on fabrication of integrated circuits in thick film, thin film, and silicon monolithic form. During the course of a semester, the student completes the fabrication and evaluation of circuits in each of the above forms. He thus knows thoroughly not only the theoretical aspects of device/circuit fabrication, but also the practical procedures and limitations. He also has used every major fabrication/testing facility found in the modern integrated circuit manufacturer's facility. The first hand knowledge and capability gained in this course gives the students a strong competitive advantage in the job market; industry eagerly seeks after these students with expertise in both the theoretical and practical aspects of circuit design and fabrication.

The course also introduces and affirms the idea of keeping a good engineering notebook. All work carried on in the laboratory -- including procedural details and failure post-mortems -- is documented in the lab notebook. The carbon sheets from the write-up of each laboratory period are turned in to the professor in charge for evaluation and comments. The student reviews the comments and uses the results to help improve his record-keeping ability.

The objective of the notebook keeping is that the student learns to keep a precise, written record of his laboratory experiences and that he will be able to make use of this record at a later time. Most students keep their notebooks for future use, and some have made immediate use of them in getting a circuit fabrication facility operational immediately after graduation.

OFF-NETWORK TELEVISION PROGRAMMING -- "ONE STEP BEYOND"

James J. Wagner
Coordinator, Television Network Relations

Robert Thomas, formerly vice chancellor for communications for the State University of New York has compared new and innovative technological change in the field of education to the beginnings of the agricultural technological revolution. He states, "The fundamental problem in both instances is the basically conservative constituency with which the innovators had to work . . . on the one hand self-employed farmers free to pursue their own ways without interference and deeply conservative and resistant to change; on the other hand, tenured faculty members relatively free to pursue their own ways, and again, conservative and resistant to change. Neither group was likely to embrace technology warmly, yet gradually over a period of time a technological revolution in agriculture did in fact take place. The fruits of that revolution have resulted in greatly improved products at lower production cost per unit."

In retrospect, one might draw a parallel to Dr. Thomas' statement in reviewing the development of the Indiana Higher Education Telecommunications System (IHETS).

I am reminded of the technological changes which have come about in educational and instructional television over the past 15 years here in Indiana. The nation's first and only experiment in airborne television was headquartered at Purdue in the late 1950's and early 1960's. The Midwest Program for Airborne Television Instruction (MPATI) was an experiment of magnitude requiring a great amount of coordination to maximize instructional television utilization in schools covering approximately a 300 mile radius from a point in central Indiana.

Then, shortly after the early 1960's, technology again changed the pattern with the development of smaller, more portable, video tape recorders. Now, tapes could be used in classrooms at the discretion of the teacher, and, as a time asset, could be replayed many times if needed. This process allowed for more flexible and individualized programming by television.

It was during this early 1960 period of time that Purdue Univeristy linked each of its regional campuses to the Lafayette campus via a microwave closed circuit television network, so that seminars, conferences and credit course activities could be participated in mutally among the several campuses. The Indiana University campus at Bloomington, Indiana was incorporated in the same experiment; and, for example, engineers and astronomers at the respective campuses participated in "Radio Astronomy" utilizing mutual instruction. Some of the needs of these two groups were required by the demands of the rapidly generating space program.

In the late 1960's, the Indiana state legislature approved funds to not only link Indiana University at Bloomington with Purdue's campuses, but to further interconnect all state supported institutions of higher education. So, it is now possible to telecast simultaneously, live or prerecorded programming, credit and non-credit, to as many as 13 locations within Indiana via the closed circuit network now known as IHETS.

The 13 locations in Indiana are rather well distributed geographically and certainly serve the more populated areas of our state quite well. However, a few of the more sparsely populated areas of Indiana are not, as of this date, served by the IHETS microwave television interconnect. In an effort to extend programming currently on the IHETS network, during the 1974 spring semester, Purdue University is involved in an innovative and somewhat exemplary attempt to involve off-network locations in its programming for the first time.

Crane Naval Ammunition Depot is located approximately 25 miles southwest of Bloomington, Indiana. They have a large contingent of engineers and technologists involved in electronics research and manufacturing. Because of their rather isolated location, they have elected to participate in a Purdue Electrical Engineering 504 course by video tape. The course is for credit and the video tapes are mailed to the Crane, Indiana installation each week. Conversations between students and instructor are conducted by telephone after the students have viewed the video tape replays of the classroom activities previously conducted and recorded at the Lafayette campus.

Another example of off-network television activities during the 1974 spring semester has involved sending video tapes of the Pharmacy Seminar Series to Jasper, Versailles and Richmond, Indiana. Nearly 2,000 Indiana pharmacists participate in each seminar, of which it is estimated 5-8% are off-network participants permitting their involvement without requiring more than about a 25 mile drive from their homes. The off-network participants, professionally speaking, are vitally interested in their own continuing education requirements as are the metropolitan groups and, via the described off-network process, Purdue University is serving a larger audience beyond the bounds of the network than ever before.

A third off-network activity involves Columbus, Indiana. Purdue engineering courses are being recorded on television cassettes and are used as part of a graduate engineering program at Cummins Diesel Company in that community.

These examples of the innovated process of off-network programming have proven successful. In fact, the Indiana University Law School has now expressed an interest in off-network coordination of programming for legal professionals in these same outlying locations.

As Dr. Thomas implied in his remarks, utilization of new technology is a slow process to implement both for the producing agent as well as the participant-user. If the requirements demanded by professional continuing education can be better met by this "one step beyond" process by combining IHETS and coordinated off-network programming, universities can more totally serve the educational needs of the State's constituency. This certainly represents an acceptance of technological change and innovation for the user as well as the producer groups. Via television, Indiana has truly gone "one step beyond."

PACED SPANISH

Linda Walgreen
Graduate Assistant
Department of Modern Languages

Paced Spanish was developed in 1972-73 under the direction of W. Flint Smith with the collaboration of Linda Walgreen and Jean Maull Kellie. A self-paced, contingency management system of instruction for the beginning levels, Paced Spanish attempts to more effectively meet individual needs of students with differing attitudes, motivations, and aptitudes for language learning.

The goals of the two-semester beginning sequence in Spanish are to provide students with:

1. an understanding of the fundamental grammatical structures of the Spanish language,
2. knowledge of basic vocabulary,
3. an introduction to the methods and techniques of reading,
4. a background in Latin American and Spanish cultures.

A four-skills approach is employed, that is to say, with emphasis on listening, speaking, reading, and writing. A series of tutorial tapes developed at Purdue, called AutoSpan, and the text Beginning Spanish: A Cultural Approach by Armitage and Meiden from the basis of the beginning courses.

Paced Spanish: An Overview

Paced Spanish seeks to fulfill the goals stated above in a manner which allows students a greater opportunity to achieve their potential than in the traditional courses. Based on the principles of mastery learning, Paced Spanish permits students to proceed through the course at their own pace, mastering each unit's objectives before continuing to the next unit. Students are tested when they have completed the requisite activities and feel they are prepared to be evaluated. A mastery level of 75-80% is required on all evaluations; students who fail to achieve the minimum level of performance complete remedial activities and take alternate forms of the quiz or examination with impunity until they demonstrate mastery of the material. The program is designed, however, to frequently monitor the student's progress through a unit and maximize his possiblitities of succeeding on evaluations. For example, the student employs each unit's structures and vocabulary conversationally in a classroom "interaction" with several other students and the instructor before taking the quiz. Also, his written homework is checked in an additional attempt to clarify possible misconceptions and ensure the student's mastery of the material.

The Tutorial and Testing Center, staffed approximately 40 hours per week by teaching assistants, is an integral part of the Paced Spanish program. There students receive personal tutorial assistance and take all evaluations, with immediate feedback on performance provided. The Center's extensive hours give students considerable flexibility in organizing their study time.

A second source of flexibility in Paced Spanish is the class attendance policy. Three class periods and one laboratory session are scheduled weekly. Although attendance is strongly encouraged for most students, the assiduous, well-organized student may find it necessary to attend only two classes per week in order to complete the required activities.

A system of bonus points rewards the student for superior achievement on evaluations and for homework preparation beyond the 80% minimum required to take quizzes. The bonus points help raise exam grades once the student has reached the mastery level. Final course grades are contingent upon the student's performance on examinations; successful completion of the course results in a grade of A or B. If a student fails to complete the course, he is assigned a grade of Incomplete and may continue working during the subsequent semester.

Research and Possible Outcomes

Results of extensive research currently being carried out on the achievement and attitudes of Paced Spanish students are not yet available. From data gathered during the 1972-73 pilot study and information revealed on attitude questionnaires, however, the following possible outcomes of Paced Spanish are indicated:

1. A successful experience in Paced Spanish promotes more positive attitudes toward language learning, expecially among those students who are fulfilling the language requirement. The increased probability of earning an A or B and the opportunity to be evaluated on the basis of level of achievement, regardless of time limitations, are considered by students to be positive incentives.
2. Students who complete Paced Spanish will be better prepared for subsequent courses in the language than students taught under the traditional system of instruction. The 75-80% mastery requirement in Paced Spanish assures students a high level of competency.

3. Paced Spanish students develop cooperation in their learning as contrasted with competition. They seek assistance from fellow students and no longer view the instructor as the sole source of knowledge.

Judging from these indications and the subjective reactions of students and instructors, Paced Spanish seems to be a viable alternative to the traditional beginning level sequence of Spanish instruction at Purdue University.

THE "JURY SYSTEM" IN LANDSCAPE ARCHITECTURE AS A NON-TRADITIONAL INSTRUCTIONAL ACTIVITY

T. D. Walker
Associate Professor of Landscape Architecture

This instructional methodology is used at the end, or occasionally at the conclusion of intermediate phases, of assigned problems to provide the student with a learning experience simulating an appearance before a corporate board of directors or school board of trustees as many professionals do when they present their work for acceptance. Such a methodology provides the student an opportunity to develop his verbal expertise, poise and self-confidence prior to the real experience. The faculty and his peers act as the jury to provide him with constructive criticism for self-improvement. This methodology is highly individualized, time consuming, and becomes difficult to use with large student numbers.

A MODIFIED PERSONALIZED INSTRUCTION-LECTURE COURSE IN CHEMICAL ENGINEERING

Dr. Phillip C. Wankat
Associate Professor of Chemical Engineering

A modified personalized instruction-lecture format was developed for ChE 558, Separation Processes.[1] This format utilizes the ideas of mastery learning and personalized instruction in a lecture course with set dates for all quizzes. This format utilizes some of the good features of both techniques while avoiding some of the common pitfalls.

The course which I wished to alter was Chemical Engineering 558-623, Separations Processes. This course has been taught as a combined senior elective (ChE 558) and a graduate student elective course (ChE 623) for the past several years. The students in the class are a very heterogeneous group with a wide variety of backgrounds, grade point averages and career objectives. Some of the best Ph.D. students and seniors in the bottom quarter of their class take this course at the same time. Additional problems which had to be considered were a Tuesday-Thursday-Saturday class schedule, severe competition for the senior's time in required courses, and frequent absences of seniors on interview trips. The material covered in the course includes a review of basic undergraduate separations techniques, a more advanced study of multicomponent separations such as distillation, absorption, and extraction, and an introduction to chromatography. A good textbook covering most of this material in a fashion acceptable to the instructor is available.[2]

In the Fall 1971 semester I taught this course for the first time using a standard lecture format. Considerable difficulty was encountered in hitting the proper level for lectures, homework problems and tests. Usually the unhappy medium of a level too low for the graduate students and too high for the undergraduates was acheived. In addition, it was difficult to prevent the students from procrastinating on the course work without requiring busy work. With two examinations there was considerable cramming and test anxiety. Heavy reliance on lectures made it difficult for students to make up material they missed. Because of these difficulties and a strong feeling that educational goals had suffered, I decided to develop a better method for this course based in part on the personalized instruction and mastery learning approaches.

Personalized instruction seemed to be a good technique for solving many of the problems encountered in teaching ChE 558-623, but it was felt that large numbers of drops and incompletes would be unsatisfactory in a senior elective course. In addition, it would be very desireable to be able to add new material without considerable revision. To satisfy these objectives I decided to design a course which used personalized instruction concepts but still had some of the structure of a lecture course.

The course structure that was devised uses a formal schedule of lectures, quizes and makeup quizes. A one week rotation was found to fit the Tuesday, Thursday, Saturday class schedule. During any given week, the student was allowed complete freedom to control his own progress. However, once a week he was required to take a quiz on the new material covered that week. In essence, the acceptable rate of progress through the course has been scheduled and one of the degrees of freedom of standard personalized instruction has been removed. The second change was that a regularly scheduled lecture was given once a week. This lecture was used either to present new material not in the textbook or to concisely cover the major points of the assignment.

To show how this method works the course structure will be outlined in detail. The course content was divided into one week segments (3 periods per week). Except for the first week of the semester, new material was first introduced on Tuesday when the study guide for the next week was handed out. On Thursday a lecture over the new material was given. Saturdays were reserved for makeup quizzes. On Tuesday a short discussion was held, any questions were answered, and then the first mastery quiz over the material was given. Students were strongly encouraged to study on their own since only a portion of the weekly assignment was covered in the lecture.

A present grade of 85% was required to pass each quiz. Students failing Tuesday's quiz were required to take the makeup quiz and to turn in a set of homework problems on Saturday. Students who passed Tuesday's quiz were not required to do the homework. Students were allowed to look at their quizzes, but they were not returned since they were reused the next time the course was taught.

Students were not required to attend class on Tuesday or Thursday, but they were required to attend class on Saturday if they needed to makeup any quizzes. Anyone skipping a Tuesday quiz had to do the homework and take the makeup on Saturday.

The study guides handed out each week used the following format.

The week's schedule and the required reading assignment were given. After this was an annotated bibliography of supplemental readings for students who wanted to dig deeper or who wanted a bibliography for future reference. Then the important ideas to be obtained from the assignment were given in very general terms followed by a list of specific behavioral objectives. The students were told that all quizes would be designed to test for satisfaction of these objectives. The final part of the study guide was a series of homework problems with certain problems designated to be handed in on Saturday by students failing Tuesday's quiz. Most of the reading assignments and approximately one quarter of the problems were from the text by King.[2] Additional reading was occasionally required from other texts or from three programmed instruction handouts prepared by the instructor.

The use of short quizzes was not applicable in two sections of the course where fairly long problems had to be solved. In these sections the usual pattern was adjusted by use of take-home quizzes instead of short quizzes. Unsatisfactory work on the take-home quizzes was returned to the students and they were required to redo the quiz.

The original format was satisfactory except for the grading system. The grading system was revised for the Fall 1973 semester and has been revised again for the Fall 1974 semester. This latter scheme is expected to be satisfactory. Upon passing all quizzes and the two take-home quizzes the student has a minimum grade of C. This grade is unaffected by the number of quizzes that had to be repeated. The student can elect to keep this grade or he can try for a B or an A. A B will require one of the following while an A will require two of the following: 1. Completion of a self-paced (no lectures) module on chromatography, 2. Solution of a fairly difficult computer problem, or 3. Obtaining an 85 or better on the optional final. Partial credit will be allowed on parts 2 and 3. This scheme allows the student to contract for his grade and acheive any grade he desires if he is willing to spend sufficient time.

The course has been taught using this format twice. In my opinion the students learned the material much more thoroughly and had a better attitude towards it than the students in the standard lecture course. This opinion was strengthened by informal conversations and by having three volunteers take the final examination used in the lecture course. Without any additional study each volunteer scored considerably better relative to the average on the lecture course final than he had on his own final examination.

A total of 63 undergraduates and 13 graduate students have taken the course in the modified format. There were no incompletes and only one drop which occurred the fourth week of the semester. Student course ratings have been very high and were higher than my ratings in lecture courses. The majority of the students felt that the work load was about right although a few of the poorer students felt it was excessive. Informally, over 85% of the students indicated they would be happy to take a similiar course again.

The course lectures serve to structure the rate of progress in the course. They are also a very convenient method of introducing new material or material not in the textbook. Important points can be emphasized and feedback from the students can be obtained. The lectures also serve as a crutch to help students can be obtained. The lectures also serve as a crutch to help student wean themselves from over dependance on the instructor. Attendance at the lectures was excellent.

This format greatly reduced test anxiety and cramming. Some accommodation to personal interests and individual learning rates can be made. It was relatively easy for students to make up sections they missed while on interview trips. In addition, no expensive equipment or special rooms are required and class size is relatively unimportant.

Setting up the course was extremely time consuming (estimated at 30 hours per week). The second time through the course it took considerably less time, but still took somewhat more time than a standard lecture course. This additional time appears to be justified because of the increased student interest and learning.

Acknowledgement

The encouragement and inspiration of Professor John Feldhusen and knowledge obtained from his course PSY 695 were essential for the development of this course.

References

1. Wankat, P. C., "A Modified Personalized Instruction Lecture Course," in J. M. Biedenback and L. P. Grayson (eds.), Proceedings of the Third Annual Frontiers in Education Conference, held at Purdue University April, 1974, IEEE, N.Y., 1973, pp. 144-148.

2. King, C. J., Separation Processes, McGraw-Hill, N.Y. 1971

INDIVIDUALIZED INSTRUCTION IN ANATOMICAL AND MECHANICAL ANALYSIS OF HUMAN MOTION

Dr. Carol J. Widule
and
Dr. Gladys E. Garrett
Department of Physical Education for Women

Students entering a course bring a diversity of skills and knowledges from past experiences and have varying facility for processing and assimilating new information. Indivdual differences are particularly evident among Purdue University stendents enrolled in PEW 320, "Analysis of Human Motion," one of the core courses in the movement sciences major. The course content assumes previous work in gross muscle anatomy as well as a knowledge of algebra, trigonometry and elementary mechanics. The desireable background preparation for the course may have been acquired in a variety of ways and at different stages of the student's academic career. Prerequisite courses may have been taken in high school, at Purdue or at other colleges and universities. And each student retains a different amount of information from these previous experiences.

Over the years, various methods have been tried to order to meet the needs and interest of each student in the course. In the second semester of the 1971-72 academic year, a visual-audio-tutorial (VAT) minicourse approach to the course was initiated. The approach included computer assisted instruction (CAI) for presenting some of the course content.

The VAT minicourse experiences are patterned after Dr. Samuel Postlethwait's audio-tutorial approach to learning. To assist in meeting the needs of PEW 320 students, each minicourse lists the prerequisite knowledges and skills required for successful completion of the experience. If the student does not meet the minimum level of competency on the prerequisites, the student is referred to one or more sources for review; to another minicourse, to a particular reference, to a review section included within the particular minicourse. Students may take as long as necessary to complete the minicourse. Those who are in need of review will obviously take longer than those who are not.

INSTRUCTIONAL SYSTEMS APPROACH TO THE TEACHING OF FUNDAMENTALS OF SPEECH COMMUNICATION

Raymond S. Wilkes
Assistant Professor of Communication
Coordinator of Fundamentals of Speech Communication
Fort Wayne Campus

In February of 1974 the first unit of a twelve unit system for Fundamentals of Speech Communication was implemented in the Communication 114 course on the Fort Wayne Campus. The system has been designed to overcome some of the major problems in teaching a large multi-section communication course in which student oral performance and evaluation receives primary emphasis. Specifically the system attempts to:

1. Clarify course objectives for both students and faculty.
2. Provide coordination and consistency among the various sections of the multi-section course.
3. Present material in such a way that immediate feedback is available to the student and competence is obtained at one level of learning before proceeding to a second level.
4. Reduce the degree of subjectivity in the evaluation of student oral performance.
5. Allow for differences in student ability by allowing students to set their own pace of learning.
6. Reduce the number of faculty needed to teach small recitation sections.

The system is designed for a semester course presently meeting forty-five (45) times during the regular semester. The system is made up of twelve content units which when fully implemented will be presented in two sub-sets of six units each. The first six units deal with the "Elements of the Speech Communication Process." In the first sub-set of units the student must complete Unit I, "The Speech Communication Process", before proceeding to any of the five remaining units in the first sub-set. Upon completion of Unit I, the student may take up the remaining five units.

At present the interaction lectures are presented to the students during large lecture section meetings. When the system is fully implemented these lectures will be available for viewing on an individual basis at a time convenient to the student. As in the terminology section of the unit, students unable to achieve the objectives of self-test #2 may review the lecture and seek tutorial assistance when necessary.

Having satisfactorily completed both the terminology and application sections of the unit, the student may next complete the activity section of the unit. The activities explained in each unit monograph offer the student the option of either an oral or written activity related to the content of that unit. The oral activities are aimed at developing synthesis skills while the written activities focus on evaluative skills.

Developing a system for the practice of oral communication before an audience which allows the student to proceed at his own pace and offers some form of criterion reference evaluation provided the greatest challenge and the most unique feature of the project. At present each student attends a recitation section along with nineteen other students twice a week for fifteen weeks. The system provides that these hours of recitation be divided into four parts so that at each meeting four students will each have fifteen minutes to complete an oral activity of his choice before an audience of his peers. Each student in the recitation section has five such periods before the peer audience during the course of the semester.

The steps in preparing, presenting, and evaluating oral presentations are again detailed in the unit monograph. Sample presentations will be available to students in the form of video tapes. In using the fifteen minute period the student simply explains to his audience which unit he is working on and makes his presentation (usually 3-5 minutes in length). The presentation is recorded on video-tape for later study and evaluation. Following the presentation, the student asks his audience to respond in writing to specific questions outlined in the unit monograph regarding his presentation. When tabulated, these responses provide the student with specific feedback regarding the achievement of his behavioral objectives. Using the audience feedback as a guide, the student, on his own time, views the recording of his presentation, identifies problem areas, makes corrections, and rewrites the presentation. In addition to providing the student with an objective criterion reference evaluation of his presentation, it has been found that the use of the peer audience response as the measure of communication effectiveness improves not only the speaking skills of the presenter but the listening skills of the audience.

Since each unit is geared to an advancement through levels of learning, the use of this system's approach lends itself well to contract grading which can be based on more than simply quantity of work. A basic requirement for a "D" in the course is the completion of the first two sections of all twelve units. Thus, it can be said of a "D" student that he can understand and apply all of the basic principles of the course. The requirements for a "C" go beyond those of a "D" to include successful completion of five oral activities. Thus, a "C" student should be able not only to understand and apply the principles but synthesize many of these principles into an original oral presentation. For the "B" and "A" student the written activities provide a means of developing skills in the evaluation of the communication of others.

While the system will not be fully implemented until 1976, early statistical and observational data indicates that it is workable. Student performance is improved and attention and involvement in learning is increased.

When fully implemented, the need for "mass" lectures will be eliminated. Individualized pacing will be possible but the five performance segments during the semester will provide an incentive to progress. The use of criterion-reference evaluation, self tests, peer audience feedback, and video tape will reduce the need for close faculty supervision. It should be possible in most cases to use student monitors and tutors and reserve faculty time for those students with specific needs and interests.

INDIVIDUALIZED INSTRUCTION IN BEGINNING GERMAN

Dr. Joe Wipf
Assistant Professor of
Modern Languages and Education

This course option has several advantages over the conventional two-semester course.

1. Three alternative tracks provide the student a choice of self-pacing: he may complete the 101-102 sequence at a self-determined accelerated pace; he may take the normal two semesters; or he may, without penalty, spend three semesters on the beginning course.
2. Once he has chosen his own pace, the student is free to set up his personal study and test schedule within certain departmental guidelines.
3. The testing in the course consists of Unit Tests, each of which is cumulative in scope. The average of grades achieved on these determines the semester grade. There are no mid-term or final examinations.
4. Because of the individual schedules, the four-day-a-week attendance requirement is modified to release the student for private study. The instructor is available at all class hours and at other designated hours for individual help and testing.

One word of caution is necessary, however. Each student should determine that he possesses the required discipline for self-study and achievement not imposed by daily homework assignments and the possibility of classroom recitation.

The materials and expectations are identical with those in the conventional class of beginning German. This option offers the student an alternative route to the same goals.

For further information about this course, please contact Professor Joe Wipf, Department of Modern Languages, Stanley Coulter Hall 248, phone 49-45197.

I. INTRODUCTION TO STUDENT: The purpose of this Individualized Instruction Course is to give students the opportunity to study German more independently and to allow greater flexibility in the learning pace than the traditional courses offered.

II. COURSE DESCRIPTION

A. Options: The basic materials and requirements will be similar to those of the conventional course. You will, however, be able to select from one of several plans, which indicate how soon you will complete German 101 and 102.

1. PLAN I. If you wish to complete the course in less time than the traditional two semesters, you may proceed at any rate faster than that of the traditional course. (The only limitation is that you cannot complete more than one unit per day. This is necessary to evaluate completed work.) Feel free to see your instructor about designing a plan/schedule suitable to you.
2. PLAN II. Complete German 101 and 102 in 2 semesters (same as conventional course).
3. PLAN III. Complete German 101 and 102 in 3 semesters.

A. Materials:

1. Basic Text: German: A Structural Approach (2nd ed.)

by F. W. Lohnes and F. W. Strothmann, Norton & Co., 1973.

2. Workbook - Lab Manual : Study Guide for the above.

C. Procedures:

1. In order for students and staff to become mutually acquainted and to facilitate familiarity with the program, all students will be required to attend classes regularly until the first two units (chapters) have been completed. At that time you will be asked to select one of the three plans above. You must proceed at the pace prescribed by this plan. In the event this pace is too slow for you, you may switch to a faster plan, IF YOU CAN MEET THE REQUIREMENTS OF THAT PLAN BY THE END OF THE SEMESTER. After the completion of Unit 2, it is recommended that you attend classes a minimum of once a week.

2. The material in the Basic Text is divided into 13 Units. Mini-Tests covering parts of each Unit have been designed to aid the learning process. Practice Tests (both oral and written) covering an entire Unit will indicate whether you are ready for the Unit Achievement Test (also both oral and written). The average of these Unit Achievement Tests will determine your course grade. (Units 1-7-German 101; Units 8-13-plus 2 short readers-German 102). A grade of no lower than "C" is allowed on the Unit Achievement Tests before proceeding to the next unit. In the event of a grade lower than "C", a parallel test can

be taken-but no sooner than two days after each unsatisfactory performance.

3. Your instructor will provide you with lesson/study plans for each Unit in the Basic Text. You should complete all exercises in the Basic Text and in the Study Guide, as well as complete the Mini-Tests before requesting a Practice Test.

4. Students are expected to attend the language lab regularly and/or to have the tape recordings copied for private use. (To facilitate mastery of the sound system you will be required to memorize the "conversations" in the first two Units.)

D. Credit: Credit for German 101 and 102 will be awarded and a grade will be assigned at the end of the semesters in which you complete Units 7 and 13 respectively. A grade of "Incomplete" will be reported until that time.

MAXIMUM NUMBER OF CLASS SESSIONS FOR COMPLETION OF UNITS

Unit No.	PLAN II		PLAN III	
1	7		10	
2	8		12	
3	8		12	
4	9		13	
5	9		14	
6	9		14	
7	10	60	15	90
8	10		15	
9	10		15	
10	10		15	
11	10		15	
12	10		15	
13	10	120	15	180

N.B. 1) The Unit Achievement Tests must be taken no later than the last day allowed for a given unit. Penalty for tardiness: one letter grade per day.

2) All Practice Tests must be completed at least one day before the Unit Achievement Tests.

3) German 102 Dealines for Outside Reading Tests:

O.R. Test I: Before beginning with Unit 10.

O.R. Test II: Before beginning with Unit 12.

4) Use the blank syllabus on the following page to plan your schedule for the semester.

PURDUE UNIVERSITY Name____________________
Department of Modern Languages
FALL SEMESTER 1973
German 101 Individualized Instruction

PLAN I II III (Circle one)

WEEK OF:	DAY 1	DAY 2	DAY 3	DAY 4
Aug. 27				
Sept. 3				
Sept. 10				
Sept. 17				
Sept. 24				
Oct. 1				
Oct. 8				
Oct. 15				
Oct. 22				
Oct. 29				
Nov. 5				
Nov. 12				
Nov. 19			Thanksgiving Vacation: Thurs.-Sun.	
Nov. 26				
Dec. 3				
Dec. 10				

NOTE: 1. All tapes are labelled B05. The next two numbers indicate the lesson number. The last four digits specify whether there are two (.01-02) or three (.01-03) tapes for a given lesson.

2. Pronunciation drills (pp. xx-xxxiv) are catalogued as follows:

Drills 1-10: B05.00.01;
Drills 11-23: B05.00.02;
Drills 24-35: B05.00.03;
Drills 36-46: B05.00.04;
Drills 47-55: B05.00.05.

Instructor's name:____________________

Office- S.C. Hall room:____________________

Office hours:____________________

Tel. #:____________________

SYSTEMATIC GROUP TRAINING, SERVICE AND RESEARCH PROGRAM

Thomas H. Zarle
Assistant Professor, Psychological Sciences
Associate Director, Testing and Counseling Center

This program attempts to provide training experience, service and research opportunities by offering two sequential courses. The first course combines the following phases: a) didactic/seminar on theory, research and practice; b) skills training; and c) a mini-practicum sequence in conjunction with Psychological Sciences 120. Students are exposed to various theories, research findings and practice that incorporate group procedures in training or treatment. A section of the course focuses on specific leadership skills for group leaders and uses videotape techniques to facilitate the learning process. At approximately the end of the first quarter of the semester, a one day mini-practicum workshop in group leadership is provided. The workshop is offered in conjunction with Psychological Sciences 120 experiences provided these students. Psychological Sciences 120 offers a number of learning opportunities to students via contractual arrangements with students. In the group dimension of this latter course, a structured workshop is conducted that focuses upon specific group phenomena (e.g., decision making, communication patterns, conformity issues, etc.). Graduate students leading these workshops are supervised via videotape. The mini-workshop phase is repeated at the end of the third quarter of the semester to provide an advanced and follow-up training experience for the graduate student group leaders.

The second course focuses upon the use of groups as a preferred mode of training or treatment. In this course the students form teams for the purpose of identifying a specific population with whom they wish to work, developing a treatment approach and conducting a treatment program. The students are required to prepare the treatment program, conduct the program and evaluate the outcome and procedures. Specific problems (e.g., marital aggression groups, social skills training, non-verbal communication, dissatisfied graduate students, etc.) are identified and treated. The purpose of this course is to provide graduate students in Clinical and Social Psychology and Counseling and Personnel Services with training in identifying systematic methods for providing treatment/training services. Additional purposes of the course are to provide service to various populations at Purdue University through the Psychological Services Center and to provide a framework for a group research program. In addition to the project phase of this course, a seminar and skills training phase is provided that builds upon the training offered via the first course.

THE SPAN PLAN PROGRAM FOR WOMEN

Dr. Cecelia Zissis
Associate Dean of Women

In response to the increasing number of mature women utilizing the services of the Office of the Dean of Women at Purdue University, the Span Plan Annex in cooperation with the Division of Conferences and Continuation Services, developed in the fall of 1972 an eight weeks non-credit class series entitled "Educational Planning for Women". The class has been offered on the University campus as a night class from 7 to 9 p.m. for a minimal fee of $8.00.

The class was designed to meet the following objectives:

1. To assist women in examining current life styles and to help them in determining their interests, capabilities, and needs.
2. To provide general and specific information about opportunities in education, volunteer activities, and employment on the campus and in the community.
3. To offer support and encouragement in helping women build self-confidence and gain more self-understanding.
4. To create a climate of shared concern for women where group interaction and interpersonal relationships may be stimulated.

This particular model of a group series designed to reach women who are interested in exploring their educational horizons seems to offer useful design and structure. It has met with excellent response and has been oversubscribed each semester in the two years it has been offered.